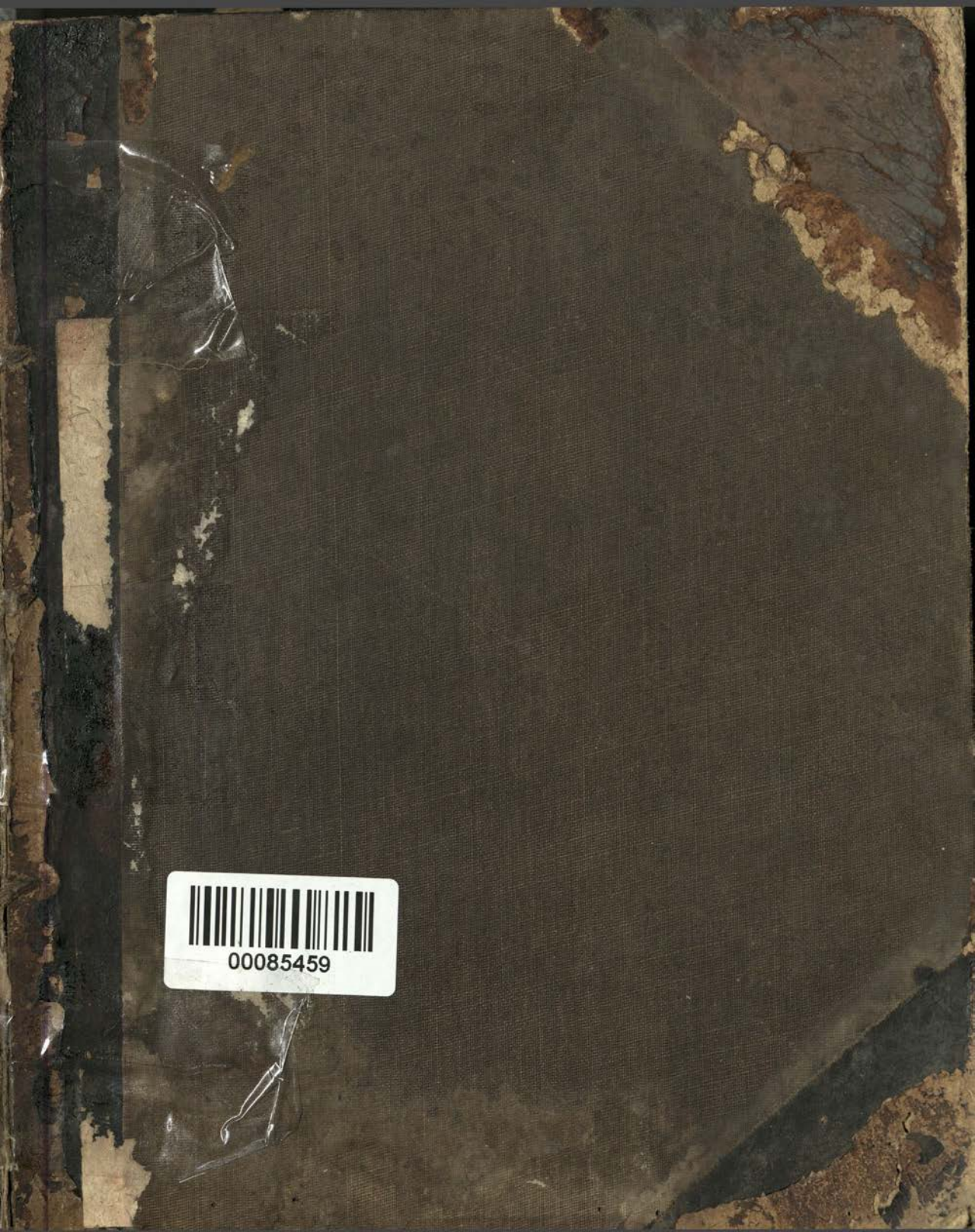
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# TRAVELS IN SWEDEN,

DURING

## THE AUTUMN OF 1812.

BY THOMAS THOMSON, M.D. F.R.S. L. & E. F.L.S.

MEMBER OF THE GEOLOGICAL SOCIETY, OF THE WERNERIAN SOCIETY, AND OF THE IMPERIAL CHIRURGO-MEDICAL ACADEMY OF PETERSBURGH.

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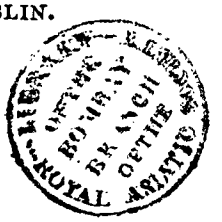

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TO

# WILLIAM RITCHIE, Esq.

ONE OF THE MASTERS OF THE HIGH-SCHOOL, EDINBURGH.

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Dear Sir,

As I had the pleasure and advantage of your company during a considerable part of the Journey described in the following work, I have taken the liberty of addressing it to you, as to the person best qualified to appreciate the accuracy of the details, and to decide how far I have availed myself of the opportunities of information which occurred to us during our tour through Sweden. I had another motive for prefixing your name to this work: I wished to erect a kind of public monument of the friendship which has existed so long between us, and which has been attended with so much gratification and advantage to,

Dear Sir,

Your's faithfully,

THE AUTHOR.

*London, 24th April,* 1813.

# PREFACE.

I OUGHT to apologise for venturing to lay before the public the fruits of a journey performed with such rapidity, and occupying so short a space of time as my tour through Sweden. My whole stay in that kingdom did not exceed six or seven weeks; and, as during that time, I traversed an extent of more than 1200 miles, it is obvious that my journey must have been made with too much rapidity to enable me to lay in any great stock of accurate information. But notwithstanding the rapidity of my journey, I found, upon comparing my journal with all the English books of travels through Sweden which I could find, that I had it in my power to lay much new information before the English reader. The mineralogy of Sweden had not been touched upon, except by one or two German travellers; and as I saw a good deal more of the country than either Haussman or Von Buch, many of my mineralogical observations will, I flatter myself, be found new. To the English reader they ought to be interesting, because they exhibit a country exceedingly different from his own, and almost entirely composed of a rock which is rather of rare occurrence in Great Britain; being, as far as my observations have gone, confined to a few districts in the Highlands of Scotland. The prodigious extent of gneiss rocks which cover almost the whole of Scan-

dinavia, when once fully known in this country, may have a tendency to prevent our geologists from explaining the structure of the earth from what appears in Great Britain alone; or from denouncing a rock as rare and insignificant, because it may happen to occur but sparingly in Great Britain.

In the account which I have given of the late King of Sweden, and of the revolution which deprived him of the throne, I am sensible that I have differed in opinion from a very great majority of the natives of Great Britain. My own opinion was at first the same with that of the rest of my countrymen. But I was at considerable pains in procuring information on the subject, and put questions to a great variety of people, Swedes and foreigners, nobility, merchants, and manufacturers, and never met with any diversity of opinion on the subject. All were unanimous in condemning the policy of Gustavus IV., and in acknowledging the necessity of the revolution.

In the account of the manners and customs of the Swedes, I have confined myself entirely to the observations which I had an opportunity myself of making. Hence my details are scanty; but to compensate for that, they may be always depended on. My information respecting the population, agriculture, manufactures, trade, revenue, mines, &c. of Sweden, is derived from very accurate tables relating to these particulars, which I partly procured while at Stockholm, and partly translated from the Memoirs of the Swedish Academy of Sciences. These tables, most of which will be found in the subsequent work, I consider as of considerable value, and as throwing a new light upon the power and resources of this northern nation, which, in the present state of the continent, may perhaps play a conspicuous part in restoring that balance of power, the loss of which has been productive of so much misery to the greatest part of Europe.

# CONTENTS.


## CHAPTER I.

Page.

Object in View—Voyage from Leith to Gottenburg—Colour of the Sea—Its Temperature—Becalmed in the Sleeve—Coast of Sweden—The Victory—Go ashore—Want of Inns—Description of Gottenburg—Its Population—Swedish Houses—Swedish Dinners—Swedish Currency—Mr. Lorent—Dr. Lampert—British Merchants settled in Gottenburg—Herring Fishery—Our Carriage—Charges at the Hotel—Rocks round Gottenburg ..... 1

## CHAPTER II.

Ancient Division of South Sweden—Method of Posting in that Kingdom—Nature of the Country—Trees—Roads—Hedges—Agriculture—Plants on the Heaths—Swedish Beds—Swedish Peasantry; selfish, contrasted with the Scotch—Falls of Trollhätte—Swedish Canals—Hunneberg—Kinnekülle—Alum Work—Glass Work ..... 21

## CHAPTER III.

Boundaries—Rivers—Lakes—South and West composed of Gneiss—Twelve Hills in the Interior—Their Heights—Account of Hunneberg and Halleberg—Of Kinnekulle—Of Billingen, and the Seven Hills near it—Of Lugnos—These Hills all composed of Floetz Rocks—Striking Similarity in their Structure—Inquiry into the Cause of this Similarity—Rest of West Gothland alluvial—Immense Blocks of Gneiss scattered through it—List of the Animals found in Gothland—Description of the Falco Umbrinus ..... 41

## CHAPTER IV.

Page

Account of the constitution of Nerike—Iron Mine of Hesselkulla—other Mines —Uncommon Frost—Tobacco—Potatoes—Malefactors hung in chains—Swedish Camp—Stopped by a Custom-house Officer—Description of Orebro—The Diet —House of Nobles—Clergy—Peasants—Burghers—Anomaly in the Swedish Constitution—Strange Laws enacted by the Peasants—Manufactures—Rocks between Orebro and Arboga — Arboga — Köping—Anecdotes of Scheele— Vesteros—Cathedral—Monuments—Fate of King Eric XIV.—Country between Vesteros and Stockholm—State of Agriculture in Sweden ..... 61

## CHAPTER V.

Situation of Stockholm—Description of the City—Statue of Gustavus Adolphus— Opera-house—Theatre—Northern Suburb—Maps of Stockholm—View from the Observatory—Number of Inhabitants—Trades—The Palace—Statue of Gustavus III.—Obelisk—Statue of Gustavus Vasa — Mint — Exchange — Churches — Religion — The Arsenal — Academy of Sciences — Collection of Minerals belonging to the College of Mines—Collection of Mr. Svedenstierna— Swedish Academy—Scottish and English Dialects compared—Account of the Swedish Language—Houses in Stockholm—Account of the Societé and the Selskap ..... 89

## CHAPTER VI.

Erroneous Opinion of Gustavus entertained in Britain—His true Character—His Superstition—Military Ignorance—Quarrel with Prussia—His War with France—Conduct in Pomerania—Supposed Treaty for the Partition of Sweden —Russians invade Finland—Arrest of the Russian Ambassador—War with Denmark—Invasion of Norway—Arrival and Treatment of the British Auxiliaries—Projected Invasion of Zealand—Conquest of Finland by the Russians— Quarrel with Great Britain—Projected Invasion of Sweden ..... ..... 114

## CHAPTER VII.

Necessity of a Revolution—Unpopularity of the King—Conspiracy in the Army— Conspirators in Stockholm—March of the Western Army—King alarmed—

Page

Determines to retire to Nyköping—King seized by Baron Adlercreutz—King makes his escape—Again seized by the Conspirators—Peace concluded—Abdication of Gustavus IV.—Duke of Sudermania made King—Prince Augustenburg, Crown Prince—King leaves Sweden—New Constitution—Death of Prince Augustenburg—Election of Bernadotte—His Character and Views—Swedish Army 131

CHAPTER VIII.

Travel to Upsala—Geological Account of Upland—Road between Stockholm and Upsala—Description of Upsala—Palace—Cathedral—Tomb of Gustavus Vasa—Of John III.—Of Catharine Jaghellon—Of the Three Stures—Curiosities in the Sacristy—Mr. Törner—University—List of Professors and other Teachers—Progress of the Swedes in Botany, Mineralogy, and Chemistry ..... 150

CHAPTER IX.

The Library—First Book printed in Sweden—Codex Argenteus—Queen Christina's Cabinet—Botanic Garden of Linnæus—New Botanic Garden—Museum of Natural History—Mineral Collection of the Chemical Professors—Mr. Ekeberg—Professor Afzelius—Hyacinth of Bergman—Laboratory—The Afzelii—Royal Society of Upsala ..... 174

CHAPTER X.

Iron Mines in Upland—Russian Soldier—Mr. P. Tamm—Description of Dannemora Mine—Ore—Method of smelting—Superiority of Dannemora Iron—Gökum-Gahnite—Ytterby—Gadolinite—List of the Iron Mines in Upland .... 186

CHAPTER XI.

Soldiers' Houses—Swedish Sirnames—Rout to Sala—Detained for Horses—Rout to Fahlun—Singular Bridges—River Dal—Character of the Dalecarlians—Description of the Province—Account of the Swedish Hills—Nature of the Porphyry Tract at Elfdal—Hisinger's Classification of Rocks—His Account of the Structure of Dalecarlia—Inferences ..... 197

## CHAPTER XII.

Page

Description of the Town—Account of the Copper Mine—Manufacture of Copperas—Sulphur Work—Rocks on the Plain—Surrounding Rocks—Rock in which the Mine is situated—History of the Mine—Method of Smelting—Assessor I. G. Gahn—Mr. Järta—Cabinet of Minerals—Minerals of Fahlun—Garnets—Octahedral Iron Ore—Automalite—Fahlunite—Pyrophysalite—Gadolinite—Tin—Sahlite—New Mineral ..... 216

## CHAPTER XIII.

Westmanland all Primitive—Lakes diminishing in Size—Account of Sala—Structure of the Country—Mine of Sala in Limestone—Veins that cut the Limestone—Silver extracted—Lead obtained—Number of Miners—Minerals found in Sala Mine—Calcareous Spar—Gypsum—Bitter Spar—Sulphate of Barytes—Mica—Serpentine—Chlorite—Salite—Hornstone—Hornblende—Galena—Amalgam of Silver—Native Antimony—Blende—Mine of Ridderhyttan—Mine of Bastnäs—New Kopperberg ..... 232

## CHAPTER XIV.

Hire a third Servant—Procure Passports—Mob of British Sailors—Detained at Fittje—Geognostic Constitution of Södermanland—Stages to Nyköping—Carriage breaks down—Lilla Oby—Olof Essen—Vein of Granite—Rivers little attended to in Sweden—Nyköping—Account of Tunaberg—Of Utö—Of Handvid ..... 246

## CHAPTER XV.

Account of Norköping—Valley of Motala—Granite Veins—Linköping—Slowness of travelling—Lake Vetter—Beauty of the Country—Ancient Castle—Waters of Medvi—Geognostic Constitution of East Gothland—Floetz Track—Porphyry at Grenna—Mineralogy of East Gothland ..... 268

## CHAPTER XVI.

Page

Account of Iönköping—Journey to Taberg—Description of that Hill—Seems to belong to the Floetz Rocks—Account of this Hill by Ascanius—Bergman—Tilas—Napioni—Hisinger—Haussman ..... 284

## CHAPTER XVII.

Stages to Helsingburg—Appearance of Smoland—River Laga—Extensive Heath—Beech Trees—Adelfors—Account of Helsingburg—The Sound—Zealand—Account of the Coal Mines at Höganäs—Geognostic Constitution of Sconia—Chalk found in it—Oland—Gottland—Stages from Helsingburg to Gottenburg—Nature of the Country—Embark in the Packet for England ..... 296

## CHAPTER XVIII.

Account of Lapland—Boundaries—Climate—Woody Lapland—Subwoody Lapland—Subalpine Lapland—Alpine Lapland—Height of the Mountains—Temperature of inland Lapland; of maritime Lapland—Temperature of the Earth—Vegetation—Table of the Plants that grow at different Heights—Effect of Snow on Vegetation—Plants of the western Coast analogous to those in Iceland and Scotland—Those on the east Side to those in Siberia—Number of Species of Plants found in Lapland—Minerals of Lapland ..... 311

## CHAPTER XIX.

Number of Inhabitants—Conversion to Christianity—Huts and Tents—Food—Dress—Customs—Swiftness of Foot—Music—Thread—Diseases—Cures—Power of the Clergy—Treatment of Strangers—Marriages—Callendar—Stock of Rein-deer—Account of the Rein-deer—Dyes—Method of cementing Stoneware—Method of Tanning—Description of the Sledge—Method of catching Ptarmagans—Linnæus' dismal Journey in Lycksele Lapland ..... 338

## CHAPTER XX.

Norrland—Jämtland—Dahlsland—Structure—Mines and Minerals—Vermeland—Structure—Philipstad—Mines in its Neighbourhood—Minerals found in them—Other Mines in the Province ..... 368

## CHAPTER XXI.

Page

Size and Boundaries of Sweden—Account of the surrounding Seas—Their specific Gravity and Constituents—Size of the Provinces—Lakes—Rivers—Mountains—Surface of the Country—Geognosy—Formations in Sweden—Metals found in it—Table of the Iron Mines and Works—Climate compared with that of Russia—Winter—Summer—Vegetables—Trees—Fruits—Corn—Domestic Quadrupeds—Wild Quadrupeds—Birds—Fishes ..... 384

## CHAPTER XXII.

History of Sweden—Swedish Conquests—Present Territories—Number of Inhabitants—Revenues—Constitution—Army—Resources—Agriculture—Quantity of Land cultivated, and its produce—Number of Horses, Cattle, and Sheep—Manufactures—Iron—Copper—Wood—Tar, &c.—Trade—East India Monopoly—Situation of Sweden with respect to other Nations, as Russia, Denmark, Britain, France—Her present Interest—Conduct of the Crown Prince—Object which he ought to pursue ..... 413

## APPENDIX.

Tables copied from the Memoirs of the Swedish Academy of Sciences for 1809, as drawn up by Mr. Nicander, exhibiting a very complete View of the Population and Professions of Sweden before the Separation of Finland.

## INDEX.

## PLATES.

I. Portrait of the Crown Prince ..... Frontispiece
II. Map of Sweden ..... Page 1
III. Map of Gothland ..... 41
IV. View of the Hill Kinneküille ..... 51
V. The Falco Umbrinus ..... 59
VI. Geognostic Map of Nerike ..... 61
VII. Map of Stockholm ..... 89
VIII. Portrait of the late King Gustavus Adolphus ..... 114
IX. The Copper Mine of Fahlun ..... 230
X. Perpendicular Section of Ditto ..... 231
XI. View of the Mountain Taberg ..... 287
XII. Geognostic Map of Sconia ..... 284
XIII. Geognostic Structure of the Provinces ..... 308

MAP OF SWEDEN.
EN DEL AF
GULF OF BOTHNIA
BALTIC SEA
WESTERN OCEAN
GOTTLAND I.
OLAND I.
ZEALAND
LAKE WEXER
NYKOPINGS H.
STOCK HOLMS H.
CHRISTIANSTADS H.
MALMOHUS H.

# TRAVELS IN SWEDEN,

IN

# 1812.

## CHAPTER I.

Object in View—Voyage from Leith to Gottenburg—Colour of the Sea—Its Temperature—Becalmed in the Sleeve—Coast of Sweden—The Victory—Go ashore—Want of Inns—Description of Gottenburg—Its Population—Swedish Houses—Swedish Dinners—Swedish Currency—Mr. Lorent—Dr. Lampert—British Merchants settled in Gottenburg—Herring Fishery—Our Carriage—Charges at the Hotel—Rocks round Gottenburg.

HAVING finished my History of the Royal Society, and being accidentally detained in Edinburgh without any specific employment, it occurred to me that I might occupy the summer with considerable profit to myself, and obtain a great deal of amusement, if I were to take advantage of the peace lately concluded between Great Britain and Sweden, and traverse part of that vast and interesting country. My objects were not only to observe the manners and dispositions of the people, and the progress which they had made in the arts and civilization; but likewise to take a mineralogical survey of the country, as far as that could be done by hastily traversing it; to view as nearly as possible the state of chemistry in Sweden, and to make myself acquainted with the discoveries made in that science by the Swedes during the last ten years, with the greatest part of which I was unac-

quainted. As through the uncommon politeness of numerous scientific friends, with whom I contracted an acquaintance in Sweden, I possessed advantages which do not fall to the lot of every traveller, and as, from the uncommon goodness of the weather, I could make my mineralogical observations without a single interruption, I was enabled to collect together a considerable number of valuable facts. As the communication of these may be attended with some utility, I have determined to lay them before the public. I shall touch as little as possible upon those topics which have been discussed by preceding travellers in Sweden, but confine myself chiefly to those facts which came under my own observation, or which I received from men of science and intelligence, upon whom I could rely. I shall, to save trouble, write my remarks as nearly as possible in the order in which they were noted down in my journal, while I was travelling through the country.

My travelling companion, Mr. William Ritchie, of the High School of Edinburgh, and myself, went on board the Janet, a smack belonging to Kinkardine, commanded by Mr. James Wylie. The ship was in ballast, and was destined to bring back a cargo of wood and iron. This ship had lain about a week in Leith Roads, waiting till the different vessels destined for the Baltic should collect, and till the wind, which was blowing steadily from the east, should shift its direction. The fleet, amounting to 20 ships, was ready to sail on Sunday the 16th of August, 1812. But the foul wind deterred Captain Banks, who commanded the gun brig which served as convoy, and of course had the charge of the fleet, from weighing anchor before Tuesday. On that day the signal for sailing was made, and the fleet attempted to beat down. But a strong wind directly in our teeth prevented us from making much progress. Next morning, when we got upon deck, we found ourselves but a little way below Inch Keith. The wind continued unfavourable the greatest part of Wednesday, and of course we made hardly any progress. But on the evening of that day a west wind springing up raised our spirits, and enabled us to get on with great expedition.

In consequence of the strong east wind, followed by a still stronger west wind, the sea ran much higher than I had ever seen before. Our vessel too, being light, rolled about at a great rate. This produced an effect upon me which I had never before felt, though I had been frequently at sea in rough weather. Few sensations are more disagreeable than sea sickness while it lasts; I have seen a variety of things tried in order to stop it. The most successful is brisk bottled porter: a few glasses of this taken, after the sickness has continued a day or so, I have never seen fail to produce almost immediate relief. This may perhaps depend in some measure upon the briskness of the porter; but certainly not altogether, for ale, although equally brisk, has not the same effect.

On Thursday the wind settled in south by west, by the compass, and continued in that direction all Thursday, Friday, and Saturday, dying away at intervals, but continuing upon the whole pretty steady. We proceeded eastwards at a great rate; but the roughness of the sea diminished the pleasure which we landsmen would otherwise have enjoyed, in consequence of the fineness of the weather. Edinburgh lies in 3° 15′ west longitude from Greenwich, and Gottenburg is laid down in the best maps that I have seen in 12° 15′ longitude east from Greenwich; so that the difference of longitude between the two places is 15° 30′. The latitude of Edinburgh is 55° 58′ 57″, that of Gottenburg 57° 45′, so that the mean latitude of the two places is 56° 52′ nearly. We get the length of a degree of longitude in this latitude by the following proportion: as radius to the co-tangent of 56° 52′, so is the length of a degree at the equator, to the length of a degree in the latitude required. This method gives us the distance between Leith and Gottenburg, very nearly 586$\frac{1}{4}$ miles in a straight line: so that our voyage, which was performed in little more than three days, must be considered as expeditious; for we made little progress till Wednesday night, and we lay all Sunday becalmed in the Sleeve.

During this run I was much struck with the colour of the sea, which I had never before an opportunity of seeing at such a distance from land. The depth varied from 80 to 100 fathoms or more. Near the

shore, as is well known, the colour was green, and in very shallow places the water was muddy; but in deep water when the sun shines, and when the surface is tolerably smooth, it is of a fine dark blue, with a lustre very similar to that of common roofing slate. This colour put me much in mind of the blue cakes used by laundresses for bluing their linens, and which I believe consist of cobalt blue mixed up with starch. In cloudy weather the deep sea appears black: the sea in the ship's wake, in which there is abundance of foam, has a fine green colour. These facts show us that the colour depends entirely upon the depth of the sea: accordingly it is a most accurate indicator of changes in depth.

I was very much surprised to find the temperature of the German Sea so high. The summer of 1812 was one of the coldest that I ever remember. In Edinburgh, the thermometer seldom stood higher than 60°, and often considerably lower. The cold had been no less severe in Sweden, where they complained of having had no summer at all: yet on Friday I found the temperature of the surface of the sea 58°, and on Saturday 62°, though the day was cloudy and rainy: perhaps the rain contributed something to this high temperature.

On Saturday the 22d we made the coast of Jutland in the evening. The day was warm, but rainy and foggy, so that we did not see land till we were close upon it, and some of the vessels were in some danger of running ashore. The beach seemed low and sandy, and we saw no marks of inhabitants.

Sunday was a delightful day. The sea was smooth as glass, the sun was shining, and it was a perfect calm. So that we lay the greatest part of the day not far from the Scaw point. The forenoon was employed in fishing, and abundance of mackarel, gurnards, and some whitings were caught. At three we went on board the gun-brig and dined, and spent the evening with Captain Banks and his surgeon. We were treated with that true kindness and politeness which so characteristically distinguishes the officers of the British navy. For my own part, I have seldom spent a more agreeable day. Next morning, before breakfast, Captain Banks detained a small Norwegian vessel that

was crossing our track, obviously on her way to Denmark. The Captain of this vessel breakfasted with us, and gave us to understand, partly by signs and partly by means of broken English, that he was provided with a licence from the British government, and that he was on his way to Great Britain. This Captain Banks informed us is the manner in which the communication between Norway and Denmark is kept up. The captains provide themselves with British licences, load their vessels for Denmark, and run across the Sleeve. If they escape, well; if they meet with any of our cruisers they show their licences, and are left to prosecute their voyage; or if necessity obliges them, they go to a British port and discharge their cargo. This evil cannot be remedied except by putting an end to the licence system altogether; which our government ought not to neglect as soon as practicable: as it probably will be next summer, when the Russian ports will again give us an opening into the continent.

When we went aboard our own vessel, on Monday after breakfast, we were at Winga Beacon, which stands at the mouth of the small bay upon which Gottenburg is built. Few objects are more striking or dreary than the Swedish coast when approached in this direction. The bay is full of islands consisting, without exception, of the most naked and steril rocks I had ever seen. These rocks vary in height from a few feet above the level of the sea to nearly 300 feet. They are generally long ridges, precipitous on one side, and sloping more gently on the other. Not a single plant, not even a lichen or moss is to be seen upon them. So that they appear utterly unfit to contribute to the support of man. Yet here and there we saw small wooden cottages appearing under the shelter of these rocks; inhabited no doubt by fishermen and pilots, one of whom came aboard our ship.

About ten miles below Gottenburg lay the Victory, Admiral Sir James Saumarez: the only British man of war at that time to be seen. This vessel is famous in the annals of the British navy as being Lord Nelson's ship, on board of which he was killed at the battle of Trafalgar. It is now worn out, and in all probability will not go again to sea. The

rapidity with which our ships of war decline is almost incredible. I am informed by a gentleman, who has been making particular inquiries on the subject, that 12 years for each ship is the full average of the duration of the whole navy. This is a most enormous expense to the country, and must be owing to some mismanagement or other. At present our vessels of war are built in the open air, and left for several years exposed to the weather by way of seasoning, before they are finished. This I conceive to be a bad practice, and to contribute to hasten the decay of the timber. It is proper that the wood should be well seasoned; but the vessel should be kept under cover and protected from the rain and the weather.

I was struck with the great number of vessels lying in the harbour of Gottenburg. A fleet of 300 sail had left it a few days before, and the number still remaining could not be fewer. As we approached the town, we passed by a small fort called New Elfsborg, situated upon a rocky island, and intended to prevent the advance of hostile vessels. It has a garrison of 250 men.

Our vessel anchored at Mastuget, a village about a mile south from Gottenburg, and a kind of suburb. We were going ashore without any formality, when we were told by our Captain, that the laws of Sweden did not permit any passenger to land till the vessel had been visited by the custom-house officers: non-compliance with this condition, we were told, was punished by a fine of 300 rix-dollars. In consequence of this information, we thought ourselves obliged to remain aboard the vessel. The custom-house officers at last made their appearance at four o'clock, and after a slight inspection of our portmanteaus, and receiving a little money, we were permitted to go ashore. We found afterwards that there was no necessity for staying aboard as we did; that deviations from the strict letter of the law were common, and that with regard to foreigners it was usually winked at or easily made up by a little address.

We prevailed upon the Captain to row us up to town in the ship's boat. There is a canal which runs through the middle of the principal street in Gottenburg. When we came to the extremity of this canal,

opposite to the Governor's house, where the town began, a custom-house officer perceived us and our boat. He bauled out lustily and made signs to us, in a threatening manner, to bring our boat to the margin of the canal. His whole manner indicated a confident expectation of a lucrative prize. When we opened our portmanteaus, in consequence of his orders, and when he saw that they contained no contraband goods of any kind, but merely a few books and clothes, he slunk away very much disconcerted, and allowed us to proceed. When the boat had rowed as far as the middle of the street, we went ashore to look for an inn. Our surprise was not small and our disappointment extreme, when we traversed the whole city from one end to the other without meeting with any house that had the least appearance of an inn or a hotel. As we were unacquainted with the language, and therefore had no means of making inquiry, we were utterly at a loss what to do.

Luckily we met our Captain, who carried us to his broker, a gentleman who understood English: by him we were informed that Gottenburg contained no inns, but that there were two hotels at the east end of the main street, where we might perhaps find lodging and breakfast, but that they would not provide us with dinner. He told us likewise that the concourse of strangers at Gottenburg was always so great that these two houses were usually overflowing with lodgers. He immediately carried us to what he called the best of these houses, and we found to our mortification that they had not a single empty room. In the other, however, kept by a Swede, of the name of Blum, we got a couple of rooms, and began to feel ourselves pretty comfortable after the fatigues of our voyage.

This total want of inns in a place like Gottenburg, which is at present a great thoroughfare, being the channel of communication of Great Britain and the continent, is quite unaccountable. There are indeed at Mastuget two houses kept by natives of Great Britain, a Mr. Tod and a Mrs. Ribbens, which are the great rendezvouz of the captains of British merchantmen. But they are little better than ale-houses, and so crowded that you might as well attempt to lodge in the middle

of Bartholomew fair. If any Englishman properly qualified for the purpose were to set up a good inn at Gottenburg, he would be certain of making a fortune in a few years. He ought to have an English, German, French, and Swedish waiter, and he ought himself to be so far acquainted with all these languages, as to be able to understand the orders of his guests. Were he to establish a stage coach between Gottenburg and Stockholm, running twice or thrice a week, it would be an additional source of emolument, and would contribute much to the convenience of his guests. It would not be necessary to have all the horses requisite for such a conveyance in his own possession. In a country, where there is no chance of rivalship in such undertakings, the common post horses of the country would answer. It would be requisite only to settle at the different post houses the time when the horses would be required, and to keep exactly to that time. A very small capital would be required to commence such an establishment; and if it were rightly managed, nothing could turn out more profitable.

Gottenburg is entitled to the name of a magnificent city. It consists of a long wide street called *Stora Hamna Gatan* (Great Harbour-street.) The houses on each side of this street are three stories high, built of stone or brick, and covered with white plaster. The windows are large, and all of them are folding windows after the French fashion. No sashes are to be seen in Sweden. The roofs are mostly flat and concealed. The houses are all large, and some of them are decorated with pillars. Along the middle of this street runs a canal, which is crossed at certain places by wooden bridges. There are two of these bridges which are built for the convenience of carriages, and are decorated with wooden figures of lions and men in armour. The other bridges are only for foot passengers. This principal street is crossed at right angles by three or four other streets, through some of which the canal also runs. The principal of these are distinguished by the names of *Nord Hamna Gatan*, and *Soedra Hamna Gatan* (North Harbour-street and South Harbour-street). Parallel to Stora Hamna Gatan, both on the north and south, there run other streets which are much narrower

and not nearly so magnificent. Towards the west end of the town there is a hill about 100 feet in height, up which some streets run. On the east side there is a marsh which must be very disagreeable in summer, though it may have its conveniences in winter. The streets are all paved with round stones; but there is no foot-path for passengers either in Gottenburg or in any other town in Sweden. Indeed the scarcity of flag-stones in that country is a sufficient apology for this omission. In a church at present building in Gottenburg, and which will be a very magnificent one, the stones for the pillars and other ornamental parts, and indeed for the whole front, have been brought from Scotland at a very considerable expense.

Gottenburg having been twice burnt down within these ten years, a law has been passed prohibiting the building of any more wooden houses. This law has contributed considerably to the embellishment of the city. Gottenburg is the seat of a Swedish bishop. The town contains two Swedish churches and a German church, and formerly it contained an English church. I do not know whether it exists at present.

Gottenburg is perhaps the most thriving town in Sweden, owing in a great measure to the present state of communication between Great Britain and the continent. It serves as a kind of intermediate link, and of course has become a depot of British and continental goods. Great profits have resulted to the Gottenburg merchants, and the wealth which they have acquired is sufficiently apparent in their mode of living.

In the year 1791, I am told, the population of Gottenburg was about 15,000. In 1804 it was 17,760, in 1811 it was 24,858. This is not equal to the rate of the increase of some towns in Britain, during the same period, as London, Manchester, Liverpool, Glasgow, and some others; but it is nevertheless very considerable. As very correct registers of births and deaths are kept in Sweden, the population is known with more accuracy than in most other countries. I was at some pains to procure these documents all over the country, and there-

fore have it in my power to state the population of all the Swedish towns, and of the whole kingdom, with considerable accuracy.

Gottenburg lies upon the banks of the Gotha, which I conceive to be the largest river in Sweden. It comes from the lake Wennern, at the distance of about 50 English miles north. About ten miles from Gottenburg it divides into three branches, two of which speedily unite, inclosing a rock upon which stands an old fort called Bohus, intended to defend the city from the incursions of the Norwegians. The two branches of the Gotha inclose a pretty large island called Hisingen, and fall separately into the sea. Gottenburg lies upon the most easterly of these branches.

This city cannot boast of any great antiquity. Gustavus Vasa built a town called Lodese, and endowed it with such privileges as soon rendered it the great emporium of the north. Charles IX., when duke of Gothland, in 1604, laid the foundation of a new town in the island of Hisingen, at no great distance from Lodese, and called it Gottenburg out of compliment to his dutchy. When he mounted the throne he granted this place many privileges, established in it a trading company, and placed there a number of British troops. He granted to the Calvinists the free exercise of their religion, and rendered his new town, next to Stockholm, the most flourishing in the kingdom. Being burnt by the Danes in 1611, it was rebuilt by Gustavus Adolphus, on its present site; and its privileges being confirmed and enlarged, it soon recovered its former thriving state.

Gottenburg is regularly fortified with a ditch and wall; but is not in a state to make any resistance. When the Danes suddenly attacked the Swedes in 1788, under the pretence of assisting their allies the Russians, with whom Gustavus III. was at war, they marched suddenly towards this city. Gustavus III. was at that time in a state of great distress. He had gone to Dalecarlia to solicit the assistance of the warlike peasants of that country, and having mounted the stone from which Gustavus Vasa had addressed them, harangued them with such effect that they agreed to march in a body against the Russians.

Hearing of the march of the Danes, he hastened with the utmost rapidity to Gottenburg, and animated the inhabitants to defend their city. The Danes had taken possession of the fort of Bohus and summoned the Gottenburgers to surrender. They were not a little surprised when they understood that the king was present in person, and that he meant to defend the place to the last extremity. Fortunately Mr. Elliot, the British ambassador at the court of Denmark, prevailed on him to accept of the mediation of Britain, Prussia, and Holland, and succeeded in stopping the career of the Danes.

The principal merchants in Gottenburg are Scotchmen. In consequence of letters of introduction which we carried to several of them, we experienced from that liberal and respectable body a profusion of kindness and politeness which it was impossible to surpass, and which it would be very difficult to equal. The want of inns, and our ignorance of the Swedish language, would have made it very difficult for us to have procured dinner while we stayed at Gottenburg, but this difficulty was obviated by the merchants, with one or other of whom we dined every day during our stay in that city. The entertainments which they gave were in the Swedish style, and possessed a degree of splendour at which I was not a little surprised. As the mode of dining in Sweden is very different from the mode followed in Great Britain, I shall give a general description of a dinner, that my readers may form some notion to themselves of the customs of that country.

The houses in Sweden are fitted up with great magnificence. The public rooms are usually on the first floor, and vary from three to seven or more according to the size of the house and the wealth of its master. These rooms always open into each other, and constitute a very elegant suite of apartments. The furniture though very handsome is not similar to ours. You seldom see mahogany chairs; they are usually of birch or of some other wood painted. As the table cloth is never removed they have no occasion for our fine mahogany tables, and as the dishes are brought in one by one, and the dessert and wine put upon the table before the company sit down, they have but little occasion for a side-board. Accordingly, except in the house of Mr. Lorent, who had

a very splendid side-board made in London, I do not recollect to have seen one in Sweden, even in the houses of men of the first rank. The rooms are not provided with bells. This I am told is owing to the extreme cheapness of servants in Sweden, which enabled every person to keep such a number as rendered bells unnecessary. This reason, which I do not consider as a very good one, exists not at present, for since the loss of Finland the wages of servants have considerably increased. Bells, therefore, might now be introduced with the greatest propriety; and to a foreigner, from Britain at least, they would constitute a great convenience. I have sometimes been obliged to go three times to the kitchen during the course of my breakfast, to ask for things that had been neglected or forgotten by the servants.

The Swedes are fond of great parties. I have more than once sat down to table with nearly 50 people in a private house. The hour of dinner is two o'clock. After the company are assembled they are shown into a room adjoining the dining-room. In the middle of this room there is a round table covered with a table-cloth, upon which are placed bread, cheese, butter, and corn-brandy. Every person eats a morsel of bread and cheese and butter, and drinks a dram of brandy, by way of exciting the appetite for dinner. There are usually two kinds of bread; namely, wheat-bread baked into a kind of small rolls, for I never saw any loaves in Sweden; and rye, which is usually baked in thin cakes, and is known in Sweden by the name of *nickebroed*. It is very palatable but requires good teeth to chew it.

After this whet, the company are shown into the dining-room, and take their seats round the table. The first dish brought in is salmagundy, salt fish, a mixture of salmon and rice, sausages, or some such strong seasoned article, to give an additional whet to the appetite. It is handed round the table, and every person helps himself in succession to as much of it as he chooses. The next dish is commonly roasted or stewed mutton, with bacon ham. These articles are carved by some individual at table, most commonly the master of the house, and the carved pieces being heaped upon a plate are carried round the company like the first dish. The Swedes like the French eat of every thing that

is presented at table. The third dish is usually soup, then fowls, then fish (generally salmon, pike, or streamlings), then pudding, then the dessert, which consists of a great profusion of sweet-meats, in the preparation of which the inhabitants of Gottenburg excel. Each of these dishes is handed about in succession. The vegetables, consisting of potatoes, carrots, turnips, cauliflowers, greens, &c. are handed about in the same way. During the whole time of dinner a great deal of wine is drunk by the company. The wines are claret, port, sherry, and madeira. What they call claret at Gottenburg does not seem to be Bourdeaux wine. It is a French wine with a taste intermediate between claret and port. At Stockholm I drank occasionally true claret; but scarcely in any other part of Sweden. As all the wine used in Sweden is imported from Great Britain, our wine merchants can probably explain this circumstance though I cannot.

The Swedes employ the same articles for seasoning their food as we do, salt, pepper, mustard, vinegar, &c. I was struck with one peculiarity which I had never seen before: they always mix together mustard and sugar; I had the curiosity to try this mixture, and found it not bad. The dinner usually lasts about two hours. On a signal given the company all rise together, bow with much solemnity towards the table, or rather towards each other, and then adjourn into the drawing-room. Here a cup of coffee is served up immediately to every individual. It is but doing the Swedes justice to say that their coffee is excellent, greatly preferable to what is usually drunk in England. This is the more remarkable because the Swedes import all their coffee from Britain: its quality, therefore, is not different from that of our own, and its superiority owing solely to their understanding better how to make it. You can get coffee in the meanest peasant's house, and it is always excellent. It is usually about five o'clock when coffee is over. The company separate at this time, either going home to their own houses, or sauntering about in the fields if the weather be good.

They collect again in the drawing-room about half past six to drink tea. Swedish tea is just as bad as their coffee is good. If an epicure

could transport himself in a moment from one place to another, he would always drink his coffee in Sweden, and his tea in England. The Swedish tea is so weak, that happening one evening to sit by the lady who was pouring it out, it struck me that she had accidentally forgot to put in any tea, and was pouring out nothing but hot water: I took the liberty to notice this mistake, in order as I thought to prevent the lady, when the tea should be handed round, from being put out of countenance by the detection of the oversight. My blunder occasioned much mirth, and the company no doubt set me down as a person very little acquainted with tea. It is not the quality of the tea that is bad, but the quantity employed is so small that you do not perceive the taste of it in the water. So that in fact you are drinking in reality hot water, sugar, and cream. The Swedish cream, to do them justice, is excellent. Though I have met with some Englishmen accustomed to the London cream complain of it as too thick.

After tea the company usually sit down to cards: supper is served up about nine, and the party separate for the evening between eleven and twelve. In some houses, the interval between tea and supper was filled up by music. The Swedish instrument is a kind of harpsicord, not equal in its tones to our pianoforte. The music played is always Italian, and some of the ladies usually accompany the instrument with their voice. I could not find out that the Swedes had any peculiar music of their own; at least I could not succeed in Stockholm in procuring any specimens of it. All the music exposed for sale was Italian.

There is no money at present in circulation in Sweden; not even silver or copper. The only currency is paper, and as the notes are of very different value, they occasion considerable embarrassment to strangers. On that account it may be proper to explain them here; as it was at Gottenburg that we were supplied with such notes, and obliged to make ourselves acquainted with their value. There are two kinds of paper in Sweden: bank paper and government paper. The name of the notes issued by both is the same, but they are distinguished from each other by the word *banco* being added to the first, and

*richschels* to the second: they are of very different value. The government paper has suffered a depreciation of 50 per cent.; but the bank paper continues at par. The bank of Stockholm was established about the year 1688 by Charles XI.; and though it has undergone several fluctuations in consequence of various encroachments of the crown, it has upon the whole maintained its credit. It has been customary for many years in Sweden to suspend the cash payments of the bank whenever the state of their affairs render it necessary. This is the case at present. The bank issues no gold nor silver, but if you present a small note you may have its value in copper money. Besides the national bank, there are several private banks, at least in Gottenburg, and their notes bear the same value as bank of Stockholm paper.

The calculations are all made by means of government paper, so that when you pay in bank paper, or in copper, your payments go for one-third more than their denomination.

The money in Sweden is rix-dollars, dollars, skillings (pronounced *shillings*), stivers, and runsticks. The following is the relative value of these denominations:

| | | |
|---|---|---|
| 12 runsticks | make | 1 skilling. |
| 4 stivers | | 1 skilling. |
| 8 skillings | | 1 dollar. |
| 48 skillings or 6 dollars | | 1 rix-dollar. |

A skilling, according to the present rate of exchance, is as nearly as possible equivalent to an English halfpenny, and a rix-dollar to two shillings; but what was formerly called a copper skilling (and which is still so marked upon the coin) goes for a skilling and a half, or is equal in value to three-farthings. The bank notes are of the following kinds:

| | *s.* | *d.* | |
|---|---|---|---|
| 8 skillings | equivalent to 0 | 6 | sterling. |
| 12 skillings | 0 | 9 | |
| 24 skillings | 1 | 6 | |
| 1 rix-dollar | 3 | 0 | |
| 2 rix-dollars | 6 | 0 | |
| 3 rix-dollars | 9 | 0 | |

And so on up to 30 rix-dollars, or 4*l.* 10*s.* sterling, which is the largest note I met with, though there may be notes much higher. The government paper is now scarce. The only notes of it that I saw were the following:

| | *s.* | *d.* | |
|---|---|---|---|
| 16 skillings equivalent to | 0 | 8 | sterling, and called a *plote*. |
| 32 skillings ..... | 1 | 4 | |
| 1 rix-dollar ..... | 2 | 0 | |
| 2 rix-dollars ..... | 4 | 0 | |

In Denmark, at present, there is nothing but paper currency, as in Sweden, and their paper has been so much depreciated that their lowest notes of eight skillings Danish are only equivalent to a halfpenny sterling. These facts serve to throw some light upon the depreciation of our paper currency, a question which has been canvassed of late with so much keenness.

The gentleman at Gottenburg, who appears at present to live with the greatest splendour is Mr. Lorent, originally a Hamburgh merchant. He afterwards settled in Copenhagen as a sugar-baker. When Copenhagen was bombarded by the British, his house happened to be the only one in the row that was not burnt down. On this account solely he was accused of being in the English interest, and obliged to leave Copenhagen. He settled first in London, and afterwards went to Gottenburg. Here he established a sugar-refinery, and seems to have realized a great deal of money. What appears very singular, considering the size of the town, he is not able to procure in Gottenburg a sufficient quantity of blood for his purpose; but is obliged to import it at considerable expense from England. Any new mode of purifying sugar would therefore be to him of the utmost consequence. He is at present setting up a porter-brewery in Gottenburg. The Swedes are very fond of this liquor, and always drink it at their entertainments, though it is not much cheaper than claret wine: we were charged for it about half-a-crown per bottle, in the inns or taverns were we lodged. The whole of it is imported from London, and it pays a high duty when landed in Sweden. So that if Mr. Lorent succeeds in brewing

a tolerable porter at Gottenburg, it will be conferring a very great favour upon Sweden; though it may at first deprive the Swedish government of part of its revenue. Mr. Lorent lives at a place he lately purchased, about four English miles from Gottenburg: the place is surrounded with wood, and therefore pretty. He has a large garden under the charge of Mr. Ferguson, a Scotchman, from the neighbourhood of Drummond Castle, in Perthshire, who is introducing the British style of gardening. He praised the goodness of the soil very much, but blamed, as is usual with foreigners, the mode of gardening practised by the Swedes. I saw considerable plantations of Scotch fir, which had been imported from Edinburgh. Mr. Lorent employs also Mr. Hornblower, known for his patent steam-engine. His patent was broke in consequence of a prosecution on the part of Mr. Watt. Mr. Lorent brought over likewise several workmen from England; but they proved so unruly that he was obliged to send them home again.

I have been thus particular in my account of Mr. Lorent, because I lay under greater obligations to him than to any man in Gottenburg. He introduced me to Count Rozen, the Governor of Gottenburg, who was of essential service to me. He introduced me likewise to Mr. Smith, the British Consul at Gottenburg, one of the most agreeable and friendly men I ever met with. To him I am indebted for my introduction to the professors at Upsala, and to the mine of Danemora. Mr. Lorent likewise gave me letters of introduction to the principal literary characters of Stockholm, and by that means opened my way to every thing worth seeing in that capital. In short, he was indefatigable in his endeavours to be of service. I may say without any risk of contradiction, that he was the most polite and obliging man I ever met with.

The other persons in Gottenburg, to whom I lay under the greatest obligations, were Dr. Lampert, originally from London, but settled as a physician in Gottenburg. It was he that introduced me to Mr. Lorent, no small obligation. By his means I was introduced to the whole medical faculty of Gottenburg, in number about twelve, with whom

I had the honour of dining twice, once in the house of Dr. Schultz an old Librarian of Sir Joseph Banks, and once in the house of Dr. Dubb, Fellow of the Royal Academy of Sciences at Stockholm, at the head of his profession at Gottenburg, and one of the most eminent physicians in Sweden. I was surprised to find the utmost cordiality reigning among these medical men, and nothing of that jealousy, envy, and rivalship so conspicuous among the medical men in most of the towns of Great Britain. Dr. Lampert likewise introduced me to Dr. Eckman, who had travelled over most parts of Europe, and had a considerable collection of minerals, which he had made during his travels. This collection was not so interesting to me as some others that I saw afterwards, for the very reason that would make it more valuable in the eyes of a Swede. It consisted chiefly of foreign minerals, many of them English, and contained few or no Swedish. My principal object being to see the minerals peculiar to Sweden, I only looked over Dr. Eckman's slightly.

Next to Dr. Lampert, I must rank Mr. Kennedy, a merchant originally from Edinburgh, but long settled in Gottenburg. He carried me out to his country-house, about an English mile from town: I was much pleased with the style of his garden, and with the abundance of fruit which it contained. Among others was the Astrakan apple, which when ripe is so transparent that you can count the cells containing the seeds. Mr. Kennedy was married to a Swedish lady, one of the most amiable and accomplished women that I met with during the whole of my tour. After Mr. Kennedy, come Messrs. Barclay and Fisher, likewise two Scotch merchants, and Messrs. Dicksons, two brothers, settled for some time at Gottenburg. I ought also to mention Mr. James Sinclair, a clerk in the house of Mr. Kennedy, to whom I was indebted for my introduction to Mr. Kennedy, and for other favours.

The prosperity of Gottenburg formerly very much depended upon the herring-fishery, which was carried on in the neighbourhood to a great extent; but for some years past the herrings have left the Swedish coast, so that the fishery has sunk to nothing. The food of the herring

appears to be a small species of crab. Hence their frequenting or leaving a coast must depend upon the abundance or scarcity of this minute animal. It would possibly be practicable to propagate the breed of this creature in any particular place, and thus the annual visit of the herrings might perhaps be secured.

In travelling through Sweden, it is necessary to be provided with a passport from the Governor of the province where you first happen to land. This passport was easily procured from Count Rozen. All that was requisite was to pay some small fees, amounting altogether to about six shillings sterling.

As there are no public vehicles in Sweden, there is no other means of travelling but by purchasing a carriage. We bought a very light open one, but hardly strong enough for the purpose, for 267 rix-dollars, or about twenty-seven pounds sterling. Our ignorance of the language obliged us likewise to hire a servant, to act as an interpreter. We hired a black man from North America to conduct us to Stockholm; at the rate of two rix-dollars, or four shillings sterling per day, and his victuals on the road. We found afterwards that this was below the usual rate, because he had conducted some person from Stockholm to Gottenburg, and was anxious to get back to the place of his residence. He was very obliging, but we could not help suspecting that he had gone snacks with the man from whom we had purchased our carriage. For we told him to take a coach-maker to examine it, and see whether it was stout enough for our purpose. As the wheel afterwards gave way, we had reason to believe that he had never taken any person to inspect it.

Before leaving Gottenburg, it may be worth while to state a few particulars, respecting the charges made in the hotel where we lodged. These, the badness of the accommodation considered, were considerably higher than even in England. For two rooms, for four days, we paid twelve rix-dollars, or twenty-four shillings sterling. Our breakfast cost us from eighteen-pence to two shillings, and the washing of a shirt came to eight-pence sterling. A dozen years ago, the prices did not amount to one-fourth of the above sums. The rise has been sudden,

and is still going on: it is to be ascribed to the immense concourse of people that pass through Gottenburg, and the necessity they are under of taking that route. The renewal of the intercourse between Great Britain and Russia will serve to increase this inundation of people still more. To travel by land from Gottenburg to Stockholm is so much shorter than to pass through the Sound, and so much safer during the continuance of our war with Denmark, that few persons, who consult only their ease and safety, will take any other road.

The country round Gottenburg is the most singular which I ever saw. It consists of low precipitous ridges of rocks, running in various directions, and quite naked. They vary from 100 feet above the level of the sea to about 300. The highest which I measured, and it was the highest I observed, was 310 feet high. These ridges are separated from each other by valleys about a mile wide. These valleys afford a tolerable soil, and are cultivated. The only crops we saw were of rice, and big (a small barley): they were nearly ripe, but in a very filthy state, being in many places almost choked with thistles and other injurious weeds. Indeed the state of agriculture in this place is much lower than in any other part of Sweden that I have seen.

The rocks are all gneiss, interspersed with large beds of felspar and hornblende. But I shall enter into farther particulars respecting the mineralogy of this country, after having traversed the province of West Gothland.

# CHAPTER II.

## JOURNEY FROM GOTTENBURG THROUGH WEST GOTHLAND.

Ancient Division of South Sweden—Method of Posting in that Kingdom—Nature of the Country—Trees—Roads—Hedges—Agriculture—Plants on the Heaths—Swedish Beds—Swedish Peasantry; selfish, contrasted with the Scotch—Falls of Trollhätte—Swedish Canals—Hunneberg—Kinneküle—Alum Work—Glass Work.

WE left Gottenburg about one o'clock on Friday, the 28th August, in our open carriage, drawn by two Swedish horses, our black servant seated as postillion, and the peasant boy, whose business it was to take back the post horses, sitting beside him.

Before proceeding any farther, it will be proper to give a short sketch of the provinces into which the kingdom of Sweden is divided, leaving out the northern parts, and the islands which were not visited by us. All that part of Sweden through which we passed was formerly divided into eleven provinces, and as these still frequently occur in Swedish books, and are employed by all the mineralogists, it is proper to be acquainted with them. The following are their names, beginning with the farthest north, and going gradually to the southernmost extremity of Sweden:—

1 Dalarne, or Dalecarlia.
2 Vestmanland.
3 Upland.
4 Södermanland.
5 Nerike.
6 Vermeland.
7 Dahlsland.
8 Vestergöthland.
9 Oestergöthland.
10 Smoland.
11 Skone.

Dalecarlia will be found in all the maps of Sweden. It is a large and very beautiful province, and abounds in mines.

Vestmanland lies upon the south-side of Dalecarlia, and comprehends the modern province of Vesteros, and part of Orebro.

Upland lies upon the east-side of Vestmanland, and comprehends some valuable mines, particularly Danemora.

Södermanland is upon the south-side of Stockholm. It contains in it the mine of Tunaberg, famous for its cobalt, and some others.

Nerike is a beautiful province, surrounding Orebro, and contains a good many iron mines and some manufactures. It extends south to the lake Vettern.

Vermeland lies upon the north-side of the lake Vennern, and contains many iron mines.

Dahlsland lies upon the north of Vermeland, and constitutes the high ground upon the borders of Norway.

Vestergöthland is a large tract included between the sea, which washes the west coast of Sweden, the lakes Vennern and Vettern, and a circle of latitude a little on the south-side of Gottenburg.

Oestergöthland lies upon the east-side of the lake Vettern. Neither of these extensive districts contain mines; but their mineralogy is curious and important.

Smoland lies upon the south-side of the lake Vettern, and extends a good way south. It is very thinly peopled, and in point of soil and appearance is the worst part of Sweden which I saw.

Skone, or Scania, is the southernmost part of Sweden, the narrowest part of the peninsula. It is the greatest corn country in the kingdom, and is very well inhabited.

Such are the names of the old provinces, with which it is proper to be acquainted. The modern provinces, usually named from the principal town in the district, will be seen in the map.

We set out from Gottenburg about one o'clock, in high spirits. The day was fine, and we were not a little curious to survey the face of a country which promised to be so different from any which we had yet seen. Before entering upon the particulars of our journey through West

Gothland, it may be requisite to notice a few circumstances respecting the mode of travelling in Sweden.

As there are no stage-coaches, it is necessary for every traveller to be provided with a carriage of his own. It ought to be light, and in summer an open carriage is much more useful and agreeable than any other. The horses in Sweden are small but very active, and remarkably sure footed. Notwithstanding the great number of horses which I employed, in a journey of above 1200 miles, I never saw one of them stumble. Their harness consists of little else than common ropes, which you supply yourself. In general about half an hour was requisite to yoke a couple of horses to our carriage. Posting is under the regulation of government. Post-houses are provided at regular distances all over the country. The person who keeps these houses is called the *gästgifvar*, and he is obliged by law to keep a certain number of horses for posting. These vary from one to twenty, but the usual number is two, four, or six. Besides these, there is a certain number which the peasants in the neighbourhood are obliged to furnish, and to send once a day to the post-house; these are called *hollhäster*, or relay horses; these vary from two to twenty-two. In some counties, as Smoland, when the population is small, and the intercourse not great, there are no *hollhäster* at all. In travelling through such counties, unless you take care to send a person before you, you are quite sure to be detained several hours at each stage before horses can be procured. There is a third class of horses, called reserve horses, and which in fact consist of all the horses in the district. These the post-master is entitled to call upon in case of necessity; but a considerable time always elapses before they can be procured. If you wish to drive rapidly in Sweden, you must send a person before you, to order horses by a particular hour. This person is called a *forbod*, and by means of him you may travel as rapidly in Sweden as in England.

You pay for your horses at the rate of eighteen skillings, or ninepence sterling, per horse, for the Swedish mile, which is almost exactly equal to $6\frac{2}{3}$ English miles. But when you take horses from a town, how-

ever small, the rate of posting for that stage is increased 50 per cent. or instead of eighteen skillings you pay twenty-seven skillings, or thirteen-pence halfpenny per mile. The boy that goes with you to bring back the horses expects something: he is very well satisfied with about two-pence sterling. When you go to a stage, you must inquire for the hollenkar, a boy kept by the post-master for the purpose of getting horses for travellers. When he brings the horses, he generally expects something for his trouble, though he does not always get it. In every post-house, there is a day-book kept, in which you write down your name, where you are going, where you came from, how many horses you take; and if you have met with any grievance, there is a place for noting down your complaint. These day-books are carried once a month to the Governor of the district to be inspected: so that if any irregularity happens it cannot remain unknown. I observed many complaints in these day-books, but they were never made by Swedes, always by foreigners. Hence I concluded that most of them were imaginary, and arose from ignorance of the laws and customs of the country.

Our first object was to go to Trollhätte (pronounced *Trollhetta*), a celebrated fall of the river Gotha, not very far from the place where it issues from the lake Vennern. This place lies about 53 miles north from Gottenburg, and from the lateness of the hour at which we set out, we could not expect to reach it till next day. The following are the names of the stages, and the distances between Gottenburg and Trollhätte:—

| | Swedish miles. | English miles. |
|---|---|---|
| Lahall | 2 | 13⅓ |
| Kattleberg | 1¼ | 8⅓ |
| Kärra | 1¼ | 8⅓ |
| Forss | 1½ | 10 |
| Trollhätte | 2 | 13⅓ |
| | 8 | 53⅓ |

The road lay partly along the banks of the Gotha, a river which struck my eye as pretty much of a size with the river Forth, at Stirling,

and partly at some distance from that river. The face of the country for some time was exactly similar to the neighbourhood of Gottenburg; that is to say, it consisted of ridges of naked rocks running in various directions, and separated by narrow valleys; but as we advanced northwards the rocks became lower, and by the time we reached Trollhätte, we found the mscarcely elevated above the surface of the ground, though still as naked as ever. Indeed nearly one-half of the last stage between Forss and Trollhätte consists of a natural pavement of gneiss, as level and smooth as if it had been made by art, extending every way for several miles, and perfectly destitute of vegetation.

For some distance the country was bare of wood, but trees began gradually to make their appearance; they increased in number as we advanced north, and at last spread over the greatest part of the country. These trees consisted chiefly of two species of pine, the only species which grow naturally in Sweden: these are the *pinus sylvestris*, or Scotch fir, and the *pinus abies*, or spruce fir. Of the last species there are two varieties, one with erect and one with pendulous leaves. The last is a very beautiful tree, and where it occurs it is said to indicate a fertile soil. Birch trees are likewise common, and by their fine shape and difference of colour add considerably to the beauty of the scene. Of late the Lombardy poplar has been introduced into Sweden: it thrives well, and is usually planted by the road-side, by way of ornament. The birch is seldom to be seen in single trees: where it does occur you usually see large patches of ground covered with it; nor does it seem to have any tendency to mix with the pines. Birch is one of the most valuable among the Swedish trees. It is the best firewood in the country, burning without throwing out sparks, and producing more heat than an equal weight of any other wood: its bark is also converted into baskets, and other articles of convenience and utility. Oak is another tree which abounds in Sweden. I likewise saw abundance of alders, and of a much larger size than I had ever observed growing in Great Britain. The red fir-wood which comes to this country is the wood of the pinus abies, while the pinus sylvestris

yields the white wood. The last in this country is reckoned of inferior value to the red wood.

I was very much struck with the goodness of the roads in Sweden: they are narrower than our British roads, and sometimes you meet with pretty steep pulls in them; but they are all so smooth that they convey the idea of travelling in a gentleman's park. This goodness of the roads is to be ascribed to the same cause that makes the roads so excellent in the Highlands of Scotland. The bottom is always sufficiently hard; and at no great distance excellent materials are every where attainable; and when once the roads are made they are not liable to be cut up by heavy carriages. The carts in Sweden are all four-wheeled, and so small and light that a man could easily carry one of them upon his back, and when loaded they might be dragged on by a stout man without any difficulty. From all that I could see, I should suppose that six or seven hundred weight is an ordinary load for two horses in Sweden. The roads are under the charge of peasants, each of whom has a certain number of feet of road which he is obliged to keep in repair at his own expense. These distances are all carefully marked off by small pieces of board, upon which are painted the initials of the peasant who has the charge of that portion of road.

All the land under culture in Sweden is inclosed, not with quickset hedges or stone-walls as in Britain, but with a wooden paling. The only part of Sweden where hawthorn hedges are to be seen is the neighbourhood of Gottenburg, and the custom has doubtless originated with the British merchants settled there. In Scania I observed a hedge made of sloe-bushes; but the practice was not generally followed. The Swedish palings are very different from ours, and occasion a prodigious waste of wood. Two stakes are driven into the ground at a little distance from each other, and between four and six feet high: these are tied together in three or four places at equal distances by a kind of rope made of birch bark. A row of such double stakes at the distance of about four feet from each other goes quite round the field to be inclosed. The whole space from the ground to the top of these stakes is filled up with pieces of fir-wood lying above each other, and kept in their

places by the double stakes, and the birch ropes which support them.

These palings very frequently cross the road, and at such places there is a gate, which is always kept shut. The business of the peasant boy, who goes along with the horses in these cases, is to get down and open the gate, in order to let the carriage pass. These gates, in some parts of the country, are so numerous as materially to affect the rate of travelling. For you have always to stop a little at each of them to allow the boy to get on again. Near towns and villages the children always run before and have the gate open by the time you reach it. For this attention they are commonly rewarded with a small piece of copper money, usually about two stivers.

The corn on the sides of the road was nearly ripe: it consisted of rye and big, and a few ridges of oats. The crops in general looked well, except that they were exceedingly foul. The mode of farming was very singular. The fields were all divided into pretty broad ridges, which were occupied alternately with different kinds of grain. The first ridge in the field we shall suppose was rye, the second grass, the third big, the fourth potatoes, the fifth oats; and in this way they alternated over the whole field. I do not see any other way of accounting for this singularity than by supposing that the different ridges belonged to different individuals. Had one person cultivated the whole field, we can hardly suppose him foolish enough to adopt so preposterous a mode.

All the fields in Sweden, except those under tillage, are thick scattered with juniperberry bushes *(juniperus communis)* of various sizes, which at a distance have very much the appearance of the furze bushes so frequent in the commons in England. Neither furze nor broom are to be found wild in Sweden, not being capable of withstanding the rigor of the Swedish winter. The Swedish commons can hardly be said to be covered with grass, but are thick spread with the various berries which are to be found in great quantities in the Highland muirs in Scotland. These are rasps *(rubus idæus)*, crowberries *(empetrum nigrum)*, billberries, or blaeberries *(vaccinium myrtillus)*, red whortle-

berries *(vaccinum vitis idæa)*, cranberries *(vaccinium oxycoccos)*. Of these the *vaccinium vitis idæa* is the only one used by the Swedes. They boil it up with water and sugar, and serve it up at dinner as a seasoner of their meat; for sweet sauces are very much relished in Sweden, and are used for a great variety of dishes. I was struck with the similarity between the Swedish and English or Scotch names of some of these berries. The *empetrum nigrum* is called in English crowberry, and in Swedish *krokbärr*, which has the same meaning. The *vaccinium myrtillus*, is called in Scotland blaeberry, and in Sweden *bloobärr*, which has the same meaning, and almost the same sound. I do not recollect to have seen any specimens of the common bramble in Sweden, though I have no doubt that the plant exists in that country. I saw gooseberry bushes growing wild in several places, but they were destitute of fruit. The wood strawberry was likewise very common.

As our object was to travel as little as possible in the dark, that we might lose no part of the country, we stopt for the night at Kärra, our third stage, and distant from Gottenburg $4\frac{1}{2}$ Swedish, or 30 English miles. The house where we stopped was a cottage; but we were furnished with a room for ourselves, containing two beds, and we got for supper milk, eggs, ham, and rye bread.

The Swedish beds are very different from those in Great Britain. The bedstead is a rectangular frame, just sufficient to hold one individual, and without curtains; though in some rare instances they are provided with curtains similar to those of a tent bed. The bottom of the bed is canvas; upon this is placed a feather bed, and a very large bolster and pillow, over these are spread the sheets, and a thick but very light coverlet completes the bedding. There are no blankets to be seen in Sweden; nothing but a single coverlet laid over each bed: this coverlet is of double calico, with a considerable quantity of wool quilted in it: it is nearly half an inch thick, and very light and comfortable: the only objection to it is that when it gets dirty it must be impossible to wash it without taking it to pieces: on that account I presume it is always of a dark colour, and I never observed it quite

clean. There are usually two of these small beds in the rooms of their posting-houses, one having the appearance of a bed, the other of a chest. The chest-bed contains the pillow and bolster of the other bed, and the lid being opened it assumes the appearance of a bed, and is in every respect as good as the other, except that it is not quite so wide.

The appearance of the Swedish peasantry is very striking to a native of Great Britain, who is accustomed to so great a diversity in the features of the people with whom he associates. The Swedes have all light flaxy hair, and a ruddy countenance. I would say that a certain degree of flabbiness is visible in their complexions. There is nothing to be seen which indicates the existence of the more violent passions; but every one expresses a docility and good humour in his face, which I believe all possess, almost to a man. I have often gone into a Swedish cottage in the middle of the night, where the whole family, to the number of six or eight, were asleep in different beds; awakened the whole family, and sent the hollenkarr to ramble through the woods in the dark, to a distance of three or four miles, in quest of horses. The family were made to get up, and kept out of bed perhaps for two or three hours. All the while they preserved the most perfect good humour, never attempted to persuade you to stop all night, nor seemed to feel the inconvience to which they were put. The scarcity of copper on the road was so great that it was sometimes impossible to give the post-boy the sum which he considered as his due. In these cases he continued to request you to remember him with the most perfect good humour and politeness, and never attempted to abuse you as an English coachman would have done in a similar case. On one occasion I offered a post-boy a skilling banco, which was all the copper money I had in my possession: he returned it to me again, with the greatest good humour, and when I gave it to a boy that was standing beside him he seemed quite delighted with the joke.

The peasants in Sweden seem to be a most amiable and innocent race. Most of them can read and write: they are all clean and well dressed in coarse blue cloth, manufactured in Sweden. I do not

mean to say that blue is the only colour which they wear, but it is by far the most common. They have all round hats, and mostly wear silk handkerchiefs about their necks. The women are dressed somewhat like the common people in the north of Scotland; but they are all distinguished by a white handkerchief doubled into a triangular shape, which is thrown over their head, and tied under their chin, while one of the corners hangs between the shoulders behind.

They have one fault common to them with most nations where the communication is not very frequent. They have no fixed prices, and are always inclined to take advantage of the necessities of strangers to get a greater sum of money than is consistent with strict honour and generosity. In this respect they resemble the inhabitants of Sutherland and Caithness, in Scotland, who have the same fault in a degree if possible still greater. It would be easy to mention numerous instances in which advantage was taken of my situation by the Swedish peasants. I shall give an example or two, that my readers may understand what I mean. During the time that I was travelling over the fourth stage from Stockholm, on my way to Nyköping, or between Pilkrog and Oby, a foolish fellow of a postillion drove at such a rate as to frighten the horses: they dragged the carriage with prodigious velocity down a steep descent, and then over a very rough wooden bridge, composed of whole trees, laid side by side. The consequence was, that one of the small fore-wheels of the carriage gave way, and before the horses could be stopt, a piece of the rim of the wheel, iron and all, had fallen off. We were obliged to alight and consult what was to be done. We were told by our coachman that a blacksmith lived at a distance not greater than an English mile. We tied the wheel with ropes, and made the horses drag the carriage slowly to the place of his residence. We found his house without inhabitants, but he himself was mowing barley in an adjoining field: we went to him, pointed out our situation, and implored his assistance: he absolutely refused to leave his field, though I offered to pay him instantly whatever he should demand, alleging as a reason, that he had not a bit of iron in his possession. At last he told us of another blacksmith, about another English

mile farther on: to him we were obliged to go. We found him likewise mowing barley, and he was equally resolute in his refusal to assist us: but he told us of a cart-wheel maker, who lived at the distance of another English mile, and who would be sure to set us to rights. This man lived at a place called Lilla Oby (Little Oby) about half way between Pilkrog and Oby; his name was Olof Essen. He was not at home when we called at his house; but we found his son, who went in quest of his father, and soon brought him. He told us on inspecting the wheel, that he would make it as good as ever, but that we must spend the night with him. To this I agreed, and dismissed my Pilkrog driver and his horses. He had been the cause of our misfortune by his stupidity, and he had driven us only half-way: yet he demanded his full fare, as if he had taken us all the way to Oby. As I knew that by the Swedish posting regulations, he was intitled to make this demand, I paid it, though with reluctance. Had the same thing happened in England, I would have resisted the demand without any hesitation. I spent that day, the next night, and till about eleven o'clock next day, by which time the fractured wheel was set to rights.

Olof Essen had promised us his own horses, to carry us to Oby: he appeared to be in good circumstances: he was not only a wheel-spoke maker, but likewise a farmer, and had a great number of houses round his dwelling-house, appropriated to the purposes of his farm. His house contained two rooms on the ground floor, a kitchen and parlour, into which I was shown. It was a very neat room, square, with a wooden roof white-washed: it might be about 16 feet long, nearly as wide, and about seven feet high. The walls above the cornice were covered with paper, painted red, below it with paper painted white. There were three windows, one in the centre of each outside wall, and in the centre of the fourth wall was the stove. The furniture of this room consisted of sixteen fir chairs painted blue, three tables, one at each window, a small bed, a looking-glass, and a wooden press near the door. The floor, as usual in all the houses of the peasantry, was wood without any carpet, and seemed to be new laid. I

mention these things to show that the man was in tolerable circumstances. All the family were clean and well dressed. Perhaps when I state the fare that I met with in this house, it may be considered as militating against my conclusion, that this man was in good circumstances: but this conclusion can be drawn only by those who are not acquainted with the way in which the common people of Sweden usually live. When I inquired for dinner, I was told that they had no meat in the house, nor cheese, nor eggs. I got rye-cakes, butter, potatoes, and three eggs, which they sent out for. Dinner was served up without a table-cloth, and the dirty plates were left all night in the room without being taken away.

The charges next day were, for mending the carriage wheel two rix-dollars, banco, or six shillings; for dinner, lodging, and breakfast, one rix-dollar, sixteen skillings, or two shillings and eightpence. When we got the horses put to the carriage, Olof Essen told us that he would not allow his horses to go at all unless we agreed to pay him double fare. He knew that we were entirely at his mercy, that we could only get horses by sending to the last stage: this would put off half the day, and the charge would just come to what he demanded, I was therefore obliged to comply with his unreasonable demand: but I was forcibly struck with the want of generosity, and the selfishness which he displayed. The sum which he gained by this conduct was trifling, and did not exceed eighteen-pence; but the smallness of the sum serves only to make his conduct more glaringly striking.

The irons that served to support the springs of my carriage having been broken to pieces, in travelling over the very rough ground which constitutes the greatest part of Smoland, I got new irons put on at Helsingborg, in their place: for this I was charged six rix-dollars, or twelve shillings, which I thought exorbitant for two hours work, and a little bit of iron. I had not gone two stages from Helsingborg when these irons gave way, and upon examining them, I found that they consisted of pieces of cast-iron. Thus for a saving of a few shillings, or rather a few pence, he subjected me to the risk of not being able to reach Gottenburg.

I shall still give another example, with which I was not less forcibly struck than with those which I have mentioned. While travelling through Smoland I lost a screw nail, which served to keep one of the hinges that raised or let down the roof of the carriage in its place. At the first stage I procured an old nail from a peasant. This I drove in myself, and rivetting it in the inside, made it answer as a substitute for the screw nail. This old rusty nail was certainly not worth the tenth part of a farthing: however the peasant made a great noise about it, and insisted upon payment. By this time I was quite stripped of all my copper, and had no notes less than six shillings value. I told the man if he could get change for a note, I would pay him willingly whatever he should demand. No change could be procured, and I was obliged to go away without satisfying him. He continued to make his claim as long as I was in sight.

I could relate stories of a similar nature of the peasants in Sutherland and Caithness. Probably the same dispositions exist every where in the same circumstances: I know, however, of one striking exception; the common people in the Highlands of Scotland. I have met with examples of generosity and hospitality while travelling among them, which struck me not a little. I shall satisfy myself with a single example. About 15 years ago, my brother and myself undertook a walking expedition over part of the Highlands, in the month of August. After going to the top of Benlomond, we spent the night in Rowardennan, an inn established at the foot of the mountain for the convenience of visitors. Next day we intended to go to Aberfoil, which lies about 12 miles east of the mountain. We meant to take the direct way over the heath, where there was no road, and nothing to guide us but the direction. We got up about six in the morning, and travelled at a great rate, intending to be at Aberfoil to breakfast: but a thick fog came on, we lost all means of judging of our direction, and were obliged to go on by chance. About ten o'clock the fog cleared up all of a sudden: we found ourselves at a great height, and saw the beautiful valley of Glen Dow stretched out below us. We had gone round Benlomond instead of keeping the proper direction, and were

farther off from Aberfoil than we had been when we set out in the morning. What was to be done? We were far from any inn, exhausted with fatigue, and exceedingly hungry. In this perplexity we went up to a shepherd, whom we saw at some distance, and inquired of him if there was any inn at hand. He told us there was none nearer than 12 miles; but said at the same time, that if we went home with him, he would give us breakfast. We went accordingly, and he set before us tea, bread, butter, and every thing requisite for an excellent breakfast. When we had finished, we asked him what we had to pay? Nothing at all, says he, my name is Charles Stuart; I am always happy to confer a favour of that kind upon any person that comes in my way; and if ever I take it in my head to visit Edinburgh, I shall see you there, and you will have it in your power to return the civility.—But I must put an end to this discussion, which is already sufficiently long.

We left Kärra about half-past seven in the morning. Our first stage was to Forss. The country was beautiful, being covered with young pines. The valleys were wider and better cultivated, and the river, which occasionally came in sight, and sometimes was hid from our view, had a striking effect. The rocks were lower, and not so visible at a distance, though they still continued of the same nature as those about Gottenburg. At Forss we breakfasted, and then drove for Trollhätte. It lies out of the common road, about two Swedish miles, or 13$\frac{1}{2}$ English miles. We went nearly due west, through a flat muir, and the road consisted of a natural pavement of gneiss, quite flat and smooth. It was the most striking example of flat rocky country I had ever seen.

We reached Trollhätte about twelve o'clock, ordered dinner, and then went immediately to see the falls and the canal. Upon inquiry, we found that the only guide was a German, who understood no language but his own. This was a disappointment, as German was a language in which we could not converse freely.

The falls of Trollhätte constitute an object that must ever be viewed with astonishment and delight. The river above the falls is nearly a

mile broad; but at Trollhätte it is confined by two low hills of gneiss into a very narrow channel, which is rendered still less by several rocky islands scattered through it. The falls are four in number, and occupy the space of two miles. The whole height from which the water descends amounts, we were told, to 100 feet. This, divided by four, gives only 25 feet for the height of each fall. There is, therefore, no visible fall as in some rivers, I mean no visible interval between the river and the bottom in any place, as when water issues from a spout; all that we see is the water moving with prodigious rapidity, boiling up in every place, and all covered over with foam. The vapour rises visibly in the form of steam. The noise which this vast body of water makes in falling at such a rate for the space of two miles is prodigious, and adds greatly to the grandeur of the scene. There is one fall of sixty feet, but only a small part of the river goes that way. I conceive it is one of the sluices cut by Pohlem, during the reign of Charles XII.; though no person on the spot could give me any accurate information on the subject.

An inland navigation, which should join the sea at Gottenburg with the Gulf of Finland, or Bothnia, has always been a favourite speculation in Sweden. The project was originally started by Gustavus Vasa, and has been taken up with more or less enthusiasm by almost all his successors. Sweden abounds so much in lakes that the project does not appear to be attended with much difficulty. But the Swedes did not take the proper method to accomplish it. Instead of forming private companies for the purpose of cutting the proposed canals, they were undertaken by the sovereign himself, who carried on his plans without a sufficient regard to economy, and without being at the requisite pains in selecting the proper engineers. Hence the projects were carried on with great vigour for some time, and generally gave way at last after putting the nation to an enormous expense.

There are three lakes which occupy very nearly the whole breadth of Sweden, from east to west. These are the Venner, the Hjellmar, (pronounced *Yellmar*) which commences at Orebro; and the Mälar, at the east end of which is Stockholm. The Gotha forms a

communication between the Venner and the sea at Gottenburg, and the Mälar falls into the sea at Stockholm. The only places that required to be joined by a canal, are the lake Venner and the Hjellmar, a distance of about 48 miles, but which is so intersected with rivers and lakes as to be reduced perhaps to one-half, indeed to much less, if the river Nosta, or Svarton, as it is called in the maps, could be rendered navigable. The distance between the Hjellmar and the Mälar does not exceed a few miles. There are four places where the river Gotha is not navigable: just where it issues from the lake, the falls of Trollhätte, another fall a little farther down called the fall of Akerstream, and at Edet, where a bed of rocks rises in the middle of the stream.

The lakes Hjellmar and Mäler are united by the canal of Arboga, begun by Queen Christina, widened and deepened by Charles XI. and completed under Charles XII. Being the property of the crown it was so much neglected as to become useless. But in 1769 seven merchants of Orebro undertook to repair it at their own expense, on condition that they should receive the toll of the vessels that should pass through it. It is broad enough to receive two barks abreast, and its least depth is eight feet.

A canal was cut between the navigable part of the Gotha and the lake Venner, by Charles IX., and called by him Carlsgraf Canal. In Charles XII.'s time a sluice was erected, which gave way almost as soon as finished. Charles's object was to lay up his frigates during winter in the lake Venner, and this was the cause of a great part of the expense to which he put the kingdom. A new sluice was finished in 1754. It was 40 feet long, 18 broad, and 12 high. Being too small for the intended purpose, a new one was cut in 1768, by Gustavus III. It is 400 feet long, and consists of two locks, each 200 feet in length. The greatest depth of the water is 13, the lowest six feet. Vessels of 80 tons burthen easily pass through it, and when the water is high it admits vessels of 130 tons.

Prodigious exertions were made by Charles XII. to cut a navigable passage through the very middle of the falls of Trollhätte: but the

works constructed were not sufficiently strong, and could not resist the violence of the river. The nation was dreadfully disappointed at this failure, after such vast sums had been expended upon the undertaking. They accused the engineer of having purposely failed in consequence of a bribe received from Denmark. The real cause of the failure was the absurdity of the measures projected, which were probably conceived by Charles XII., whose imagination must have been delighted by their magnificence. In 1793 this plan of rendering the falls of Trollhätte navigable, which had been so often and unsuccessfully attempted by the Kings of Sweden, was taken up by a private company, with transferable shares, and completed without any difficulty in seven years. The method which they adopted was to join the river above and below the falls by a canal cut through the gneiss rock, on the east side of the river. This canal is 1400 feet long, about 24 feet wide, and eight deep. Towards the lower end there are five very magnificent locks. The workmanship of this canal is excellent, and the whole view of it gives much pleasure to the spectator. It is generally described by travellers as a work of unheard-of difficulty. In fact, however, it is not so difficult to make a canal through a rock as through loose sand. To cut through a rock is indeed more expensive; but nothing is wanted to ensure success except industry and perseverance. When the canal is once dug, the whole labour is over: on the contrary, in digging a canal through a sandy country, the labour is to begin after the canal is cut. Much expense and address are necessary to prevent the water from oosing through the sand, and leaving the channel dry.

The little canal at Akersträm was began in 1774, and finished about 1781. A cut was also made at Edet, but as I did not see it, I cannot venture to give any account of it. Thus the whole of the projected inland navigation is now completed, except the junction of the Venner and the Hjellmar, and this canal is at present going on, and in considerable forwardness. Mr. Tellford, from England, examined the ground, and furnished a plan; and by his advice the execution of the work was entrusted to the care of Mr. Bagge, a young Swedish gentle-

man, who had been educated as an engineer, in the house of Mr. Telford himself.

The country round Trollhätte is beautiful. The village contains only a few houses, and the only inn in the place has no more than two or three rooms for strangers. We got a tolerable dinner, and were much amused by looking over a book kept at the inn, where all strangers write down their names, and make any additional remarks they think proper. We found remarks in various languages, Swedish, German, French, and English. The English remarks were usually sarcastic, and often improperly so. I shall quote one which struck me on account of its originality. It was as follows: "You will find at Trollhätte excellent wine, meat, bread, and indeed every thing, *provided you bring it along with you.*"

From Trollhätte we went to Ny Gärden, the seat of Peter Bagge, Esq. to whom we had a letter of introduction. With him we spent the night, as we wished to examine the structure of a hill in his neighbourhood called Hunneberg. I shall give an account of this hill in the next chapter. Mr. Bagge we found a very intelligent but excentric man. He had spent several years in England, and spoke the language quite well.

I shall not attempt a particular description of the rest of our journey through West Gothland. The country was now perfectly level, with the exception of a few hills, and was generally so thick covered with trees that our view was not very extensive, and frequently limited to a few yards. For the Swedish roads in that part of the country are never straight, but wind in a beautiful and varied curve. This fanciful plan must add considerably to the distances between places. We travelled for some time along the south foot of Hunneberg. The country was alternately cultivated plains, and heath scovered with *erica vulgaris* (common heath). We reached the lake Venner at Lidköping, a small town, built entirely of wooden houses; but neat and clean, and carrying on a considerable commerce with Gottenburg. While we travelled along the margin of the lake our road was a deep sand, and consequently very heavy and disagreeable. We stopped for the night at Kollangen,

because we wished to devote next day to the examination of Kinnekulle, the most remarkable hill in that part of the country, and interesting to mineralogists. The result of our observations will be seen in the next chapter.

There are two manufactures in the neighbourhood of Kinnekulle, both of which we had the curiosity to visit. The first is an alum work, situated at Hönsäter, upon the north-west side of the hill. The alum-slate is brought from beds just in the neighbourhood. This slate is partly burnt in the open air, and partly employed as fuel for evaporating the alum lyes. By this economical process two purposes are gained: the slate is burnt, and the lyes are sufficiently evaporated. The burnt slate is put into square pits, of which they have twenty-six. Water is pumped on it, and the whole is well mixed. The liquid by this means dissolves a portion of alum. This liquid is drawn off into boilers coated with lead, and boiled down to the requisite consistency. Then it is let into oblong square vessels, where it gradually crystallizes. These crystals are dissolved in water, and the alum obtained in the usual way in a state of purity. I could not learn whether they added any salt of potash, or of ammonia to the lyes, to make them crystallize. I made use of every word I could think of, for all the salts employed usually by alum makers for that purpose. But neither my own servant, who was perfectly illiterate, nor the workmen could understand what I wanted to know. There can be little doubt that they make use of such salts; as they are employed in all places that I have ever heard of except at Tolfa in Italy, because there the rock itself contains the requisite quantity of potash. The alum-slate at Kinnekulle seems to contain no pyrites, for I saw no crystallization of green vitriol in the pits.

The glass-house lies upon the side of the lake Venner, at a place called Onez. We were surprised to find a house intended for such a manufacture built entirely of wood. But in travelling through Sweden such things occur every where. The copper founderies at Fahlun are all wooden, and so are the iron founderies at Österby. This glass work was intended solely for making windows. All the articles used

were imported. The clay for the pots came from England; the quartz which they used came from Gottenburg; I do not know where they got their alkali, but it was not the produce of the place. The only advantages which this manufactory possessed, were plenty of wood for fuel, and water carriage to Gottenburg. Their mode of making their panes is different from that practised in Britain and France, and is much slower; but on the other hand, they are more beautiful. They blow the glass into very large cylindrical jars, open at one end and shut at the other, exactly like the glass jars for air-holders used by chemists. They cut the top off each of these jars by means of a hot iron or piece of hot wood, and likewise slit it as neatly as possible from one end to the other. These cylinders are then rolled out flat upon a red hot metal plate; the consequence of which is that they are smoother than our panes, objects are seen through them in their true places, so that they have all the advantage of mirror-glass, without being so high priced. Our gentlemen of high fortune, who used to glaze their windows with Bohemian mirror-glass, might at present, when that glass cannot be procured, substitute Swedish window-glass for it. If seeing objects through their windows in their true position and shape be their only object, it would answer their purpose perfectly.

The second evening we stopped all night at Höfva, which deserves to be mentioned particularly, as it was the worst house I lodged in during the whole time I was in Sweden. We were literally obliged to sup on dry bread. For this meagre fare, and for our beds, we were charged four shillings sterling: no great sum for three persons, but enough in all conscience for the entertainment we met with.

As next morning before breakfast we had passed the bounds of West Gothland, I shall here terminate this chapter. Observing only that as I passed through Mariestadt, a small town upon the lake Venner, built by Charles IX., without stopping in it, I had no opportunity of making any observations. The country being all composed of alluvial sand, it was not in fact entitled to much attention from a mineralogist.

Geognostic
MAP OF
EAST AND WEST
GOTHLAND.
WESTERN OCEAN
WENERN
SKIKADARGS
HOFD
WETTERN
LINKOPING
HARAD

# CHAPTER III.

## MINERALOGICAL DESCRIPTION OF WEST GOTHLAND.

Boundaries—Rivers—Lakes—South and West composed of Gneiss—Twelve Hills in the Interior—Their Heights—Account of Hunneberg and Halleberg—Of Kinnekulle—Of Billingen, and the Seven Hills near it—Of Lugnos—These Hills all composed of Floetz Rocks—Striking Similarity in their Structure—Inquiry into the Cause of this Similarity—Rest of West Gothland alluvial—Immense Blocks of Gneiss scattered through it—List of the Animals found in Gothland—Description of the Falco Umbrinus.

THOUGH West Gothland contains no mines, yet its mineralogy struck me as sufficiently remarkable to deserve a particular detail. I devote a separate chapter to the subject, because I could not have mixed it with the observations contained in the last chapter without injuring the perspicuity and destroying the interest of both. I shall terminate the chapter with a list of the animals that have been found in this extensive province.

I have to regret that the specimens which I collected during my journey have not yet arrived, so that I am reduced to the necessity of drawing my descriptions partly from memory, and partly from observations written down at the time. Some difficulties will perhaps remain unresolved till my specimens arrive. For when I happened to meet with a rock which I could not readily name, I satisfied myself with collecting a sufficient number of specimens to decide the point at home, when I should have leisure to enter upon the subject. The want of these precludes the possibility of any such determina-

tion at present. Fortunately, however, these doubtful points are not very numerous.

West Gothland extends from 57° 20′ to about 59° of north latitude; and from the sea, which bounds Sweden on the west, to the lake Vetter, and even a little farther east at the north end of that lake, extending rather more than three degrees of longitude. The principal river in it, and indeed the largest in Sweden, is the Gotha, which flows out of the lake Venner, at Vennersborg, and after running about 70 English miles, or rather more than 10 Swedish miles, it falls into the sea at Gottenburg. There are three other small rivers which deserve to be mentioned, all of which rise from small lakes, and fall into the lake Venner. These are—the Noss, which enters the lake, or rather a small appendage to the lake called Dettern, a little to the east of Hunneberg; the Lid, which enters the lake at Lidköping,* and gives a name to the town; and the Tid which runs into the lake at Mariestadt.

West Gothland is nearly bounded on three sides by water: on the west by the sea, on the north by the lake Venner, the greatest lake in Sweden, and indeed the greatest in Europe, except one in Russia. When you stand upon the margin of it, you can see no land except in the direction where you yourself are; so that it has the appearance of a sea. It is about 92 English miles in length, and at its greatest breadth about 55 miles. The waters of this lake are perfectly sweet. On the east it is bounded by the lake Vetter, which occupies nearly the centre of Sweden. In length it extends from Askerlund to Iönköping, about 78 miles, but its breadth does not exceed thirteen. Its surface is about 145 feet higher than that of the lake Venner.

The south and west sides of West Gothland are exceedingly hilly, being thickly scattered with ridges of bare rock, none of which exceed 300 feet in height, and most of them are not near so high. The centre of the country, and all the parts near the two great lakes are

* The word *köping* (pronounced *chuping*) signifies a market place, and is a common termination of Swedish towns. It is obviously connected with our word chapman, which doubtless has the same origin; and the word *chipping* is a like appendage to the names of several towns in England, and bears a similar signification.

perfectly flat, and almost as level as a bowling-green, if we except twelve hills which rise in different parts of the plain, and are conspicuous, notwithstanding their small height, on account of the great levelness of the country. I measured two of these hills, which appeared to me to be highest, namely, Hunneberg and Kinnekülle.

Hunneberg was 218 English feet above Mr. Bagge's house. He told me that the elevation of his house above the lake Venner was 150 feet, I can hardly conceive it to be so much. The distance of the lake was only a few miles, and to the eye it appeared on the same level nearly as the house. But let us suppose his estimate correct. As he had the charge of the canal at Trollhätte, it is probable he would know, if any measurement was made, how much it was, and he was too much interested in the matter of fact to forget it. In that case the height of the top of Hunneberg above the lake will be 368 feet. Notwithstanding this small elevation, Hunneberg appears quite distinctly as a hill elevated above the level country, from the top of Kinnekülle, at the distance of not less than 36 miles in a straight line. This is owing partly no doubt to its vast extent, for it is a four-sided mountain, and the length of each side cannot be much less than seven miles. Besides it rises at once from the plain, with sides nearly as perpendicular as a wall, so that it is difficult to get to the top. Artificial roads have been constructed in different places; for this hill is inhabited. There are even several churches on it.

Kinnekülle is much higher than any of the other hills, but as its base is very broad, and it is composed of different terraces, elevated one above another, there is no difficulty in getting to the top of it. According to my measurement, the top of this hill is elevated 770 feet above the lake Venner. Thus the highest hill I saw in Sweden is considerably lower than Arthur's-seat, which according to General Roy's measurement is 803 feet above Leith pier. Indeed if we consider the ocean as the basis of our measurement, we shall make these heights a little greater. The falls of Trollhätte being 100 feet, and the river running about 60 miles afterwards before it falls into the sea, we can-

not be greatly beyond the mark if we allow the whole of its descent to amount to 150 feet. According to this estimate, the surface of the lake Venner is 150 feet above the level of the sea, and the heights of Hunneberg and Kinnekülle above the same level are as follows:

Hunneberg ..... 518 feet.
Kinnekülle ..... 920

The mean elevation of the whole of South Sweden above the level of the sea may be fairly taken at 200 feet. For it is not likely that any place is lower than the lake Venner, while most will even be higher than the Vetter.—The east coast indeed, as far as I have observed it, is lower than the west coast; but I had no means of determining how much, nor of guessing whether the Baltic be more elevated than the ocean.

The whole of the south and west parts of West Gothland, all that part of it which consists of ridges of rocks, with interspersed valleys, is composed of gneiss, which I conceive to constitute unequivocally the basis of almost the whole of Sweden, as far as I have seen it. This gneiss in some places puts on the characters of granite, or perhaps we may say that it contains beds of granite, interspersed here and there through it; but as a whole it can be called by no other name than gneiss. It is that kind of gneiss which Werner distinguishes by the name of oldest gneiss, because it bears a much greater resemblance to granite than it does to mica slate; being only distinguishable from granite by its slaty texture. The dip of these rocks is towards the north-west. The angle varies at different places. At Trollhätte it approaches to 70 degrees, a circumstance very favourable to digging the canal through it. At other places it approaches to the horizontal. Four miles east from Trollhätte it appeared to be quite so. This gneiss is composed as usual of felspar, quartz, and mica. The felspar predominates, and in some places nearly excludes the other constituents. Beds of hornblende, of quartz and hornblende, and of felspar, are very common in it. Crystals of hornblende, of calcareous spar, of pyrites, of titanite, may be occasionally seen in the gneiss, especially at Troll-

hätte, where it has been laid open for a great way by the cutting of the canal. I never saw any crystals of garnets in any part of the gneiss of West Gothland, though they are not uncommon in other countries.

The twelve hills, which rise in the level part of the country, all lie immediately over the gneiss. I traced the gneiss coming out below some of them, and was informed by several gentlemen, on whose accuracy I think I can rely, that the gneiss has been traced passing under all of them without exception. These hills may be reduced to three sets, which agree each exactly in their composition; namely, Halleberg and Hunneberg, Lugnos, and Kinnekülle with Billungen, and seven little hills on the south-side of it. The Swedish mineralogists consider all these hills as composed of transition rocks. This is one of the points about which I own myself not completely settled, but I conceived at the time that they were floetz rocks, some of them caped with the newest floetz trap. I shall state my reasons for this opinion, while describing the hills themselves, to which I now proceed:

1. Halleberg and Hunneberg are two hills which lie at the extremity of the lake Venner, about an English mile east from Vennersborg. Halleberg is the farthest north, and rises directly upon the banks of the lake. Hunneberg is on the south side, and is separated from the first hill by a very narrow valley. Halleberg is small and nearly circular; but Hunneberg approaches to the quadrangular, and on the south side at least, the whole of which I travelled, it is not much less than seven miles in length. I examined this hill with considerable care, devoting nearly a day to the investigation. Halleberg I did not examine; but according to Hisinger, its structure is exactly the same with that of Hunneberg, so that one description is sufficient for both.

Though the height of Hunneberg, above Mr. Bagge's house, is little more than 200 feet, yet the sides of it are so steep that I thought it would not be possible to get to the top of it. The Swedish gentleman who accompanied me dissuaded me strongly from undertaking to climb up, and told me dismal stories of persons, who had formerly been so rash as to make the attempt at the same place that I did, who had tumbled down and were dashed to pieces. But I was too anxious

to make myself acquainted with the structure of so singularly looking a hill to neglect the only opportunity that in all probability would ever occur. It looked exactly as if a large rectangular block of stone, covering 49 square miles, had been brought from a distance and placed upon the level gneiss, which constitutes the basis of the country. The top of this hill is a flat plane covered with wood. But as the ridges are quite bare, nothing is easier than to ascertain its constituent rocks. The base of these hills consists of a bed of sand-stone which lies immediately over the gneiss. It can be seen very distinctly between the two hills, but not so well upon the south side of Hunneberg. I saw a bed of it in one place nearly 24 feet thick. It is of a pearl-grey colour, pretty hard, and appeared to me to be composed entirely of grains of quartz. When exposed to the light it assumes a light yellowish colour. This sand-stone has no resemblance to grey-wacke, the only sand-stone among the transition rocks. I was tempted at first to suspect that it might be a primitive rock, and consist of a granular quartz, in which the quartz was crystallized as happens in granular lime-stone. But the want of any appearance of crystallization in the quartz grains obliged me to give up that opinion. Though the stone was hard I could perceive no traces of any other cement than quartz itself: as it is too soft for such a cement, we must conceive the real cement to be clay, though in too small a quantity to be perceived. If this be a sand-stone, as I think it is, we can only refer it to the class of floetz rocks; and this is one of the reasons which induces me to believe that these hills belong to the floetz rocks. For the same sand-stone, as we shall see, constitutes the base of all the hills.

I was told that immediately over the sand-stone there was a bed of iron-shot slate clay, intermixed with particles of pyrites. But the rubbish was so thickly laid over that part of the bottom of the hill, that I was not able to examine it. This bed is said to be a foot thick.

Next over that is a bed of alum-slate much mixed with pyrites, and about one foot and a half thick. This slate burns when kindled, and is employed by Mr. Bagge for burning his limestone. I saw one of his lime kilns at work, and satisfied myself by the smell and colour

of the flame, that the combustible was sulphur. I should have liked to have got some specimens of lime burnt in this way to try its degree of causticity, and whether it had imbibed any sulphurous or sulphuric acid. But I had no means of making such experiments on the spot, and to have brought away a piece of such lime would not have answered the purpose. It was the existence of alum-slate in this and several of the other hills in West Gothland, that induced the Swedish mineralogists to consider these rocks as transition. But I do not consider it as a sufficient argument. It is true, that alum-slate has hitherto been observed only in primitive and transition countries, but the places where it occurs have seldom been examined. It is very improbable that the alum-slate of Whitby, in Yorkshire, is either primitive or transition; the whole of Yorkshire, as far as I have seen it, consisting of floetz rocks.

Over the alum-slate lies a bed of fibrous limestone of a black colour and containing pyrites; this bed is only a few inches thick. If I recollect right it contains petrifactions, but, not having the specimens, I cannot be positive whether they occur in this or in a subsequent bed: over this bed is another of thick layers of slate-clay some feet thick.

Lastly, lies a bed of alum-slate mixed with nodules and thin layers of stinkstone. This bed is several fathoms thick, and contains petrifactions; the only petrifaction that I remember distinctly is the *entomolithus paradoxus.*

Mr. Bagge informed me, that the alum-slate of Hunneberg would not answer for making alum, that the experiment had been tried without success; but that when burnt it formed an excellent subsitute for puzzolano in water mortar.

The top of the hill consists of a bed of a rock, which assumes a columnar form, and constitutes more than three fourths of the whole height of the hill. This rock is of a dark grey colour, with a shade of blue, and the particles of which it is composed are so small that it is difficult to make out what they are by the naked eye. I conceived at the time that the constituents were augite or hornblende (I could

not be sure which) and felspar. In that case it must be considered as a greenstone; but it differs in its aspect from any greenstone that I had previously seen. The intimate mixture of the constituents might make it probable that this stone was a transition greenstone; but I could see no quartz veins which are said to characterize this rock. At the same time I must acknowledge, that the difficulty of examining this rock was so great from its perpendicularity that my survey was too imperfect to enable me to say, with certainty, that such veins did not exist. The Swedes call this rock *Trap.* The very same rock capes Kinnekülle and some of the other hills. Its nature therefore, which I hope to be enabled to determine in a satisfactory manner when my specimens arrive, will serve to decide, in a great measure, whether these hills belong to the transition or the floetz formation. I have given a sketch of the composition of these two hills in Plate XIII, fig. 1. This, like all the other similar sketches in that plate, has been copied from Hisinger's *Samling till en Mineralogisk Geografi öfver Sverige,* published in 1808; this book I have carefully consulted, and compared my own descriptions with those which he has given. And though I have not followed his opinions in every instance, yet I have been much benefited by his remarks. In that sketch the slate-clay, limestone, and stinkstone, have been all confounded with the alum-slate to which they are subordinate.

2. Kinnekülle (pronounced *Chinnycoolley*) lies upon the east side of the lake Vennef, and is of very great extent. I have given a view of this remarkable hill in the annexed Plate IV. We stopped the preceding night at its foot. But though we got up and set out by five in the morning, the examination of it, which we made merely by passing over it from the south to the north side, took us up almost the whole day. In length from north to south it cannot be less then ten miles. It lies immediately over the gneiss, which constitutes the basis of the country: this I found upon the north side immediately at the foot of the mountain. On the south and west side the soil is alluvial and nothing is to be seen but loose sand.

Kinnekülle consists of five different beds lying in regular order one

above the other. The three lowest constitute the great body of the mountain: at the top of them there is an extensive plain with several villages. The two highest beds constitute another terrace and a small cap placed in the middle of this elevated plain.

The lowest bed is a sandstone similar to that which constitutes the basis of Hunneberg, and like it containing pyrites. This bed is best seen on the north side of the mountain near the alum work. I am ignorant of its thickness, as the whole of it was not exposed.

Over the sandstone lies a pretty thick bed of alum-slate, containing nodules of stinkstone. This bed splits into very thin slates; it is employed for the making of alum at Hönssätters, near which it can be most distinctly seen. This bed appeared pretty thick; what I saw of it could not be less then 20 feet, but as the whole bed was not exposed, I do not know its whole thickness. In the stinkstone were some petrifactions: among others I observed some *anomias* and an *entomolithus paradoxus*.

The bed of limestone is very thick, it splits of itself into thin parallelopipeds like sandstone, so that when I first saw it at a distance I took it for sandstone; but a nearer inspection left no doubt about its nature. It has a grey colour, and is composed of very fine particles without the smallest appearance of crystallization. It abounds in orthoceratites and echini. I had an opportunity of examining a vast variety of specimens of it; for, near the village of Westa Plana we stopped some hours, there were many dikes of it composed of loose stones and surrounding the fields. I found a man also cutting it into the shape of troughs. From its aspect I should presume that it contains a great deal of clay in its composition; but that opinion can only be verified by a chemical analysis when my specimens arrive.

I found by a barometrical measurement, that the height of the first terrace of Kinnecülle, or the top of the limestone bed, was 347 feet above the lake: the height of the small conical hill, which constitutes the top of Kinnekülle above this terrace, is $423\frac{1}{4}$ feet.

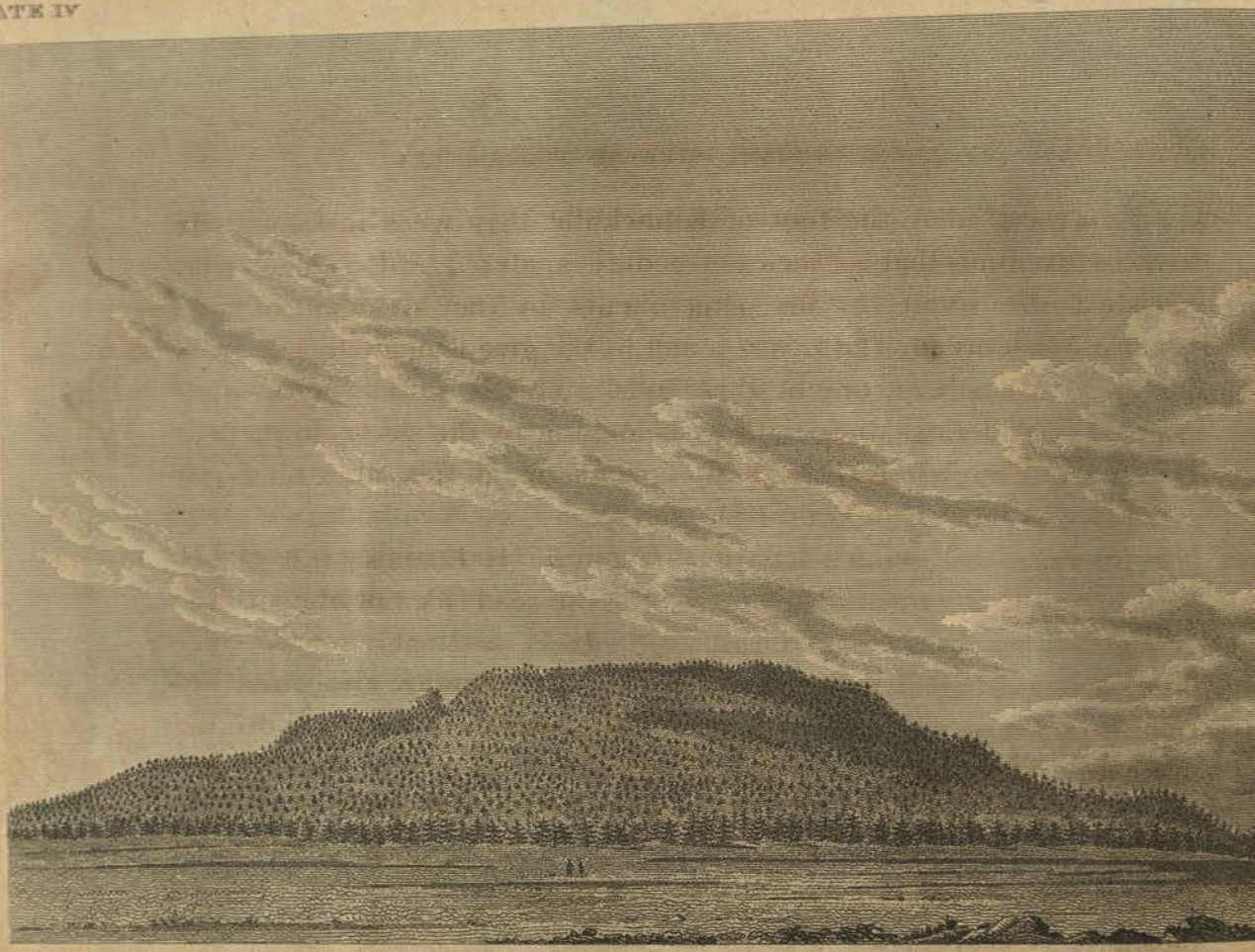
This little hill is composed of the two beds which remain to be described: the first of them consists of a very thick bed of slate-clay

mixed with marl-slate. This bed is seen very distinctly as you ascend the hill from Reseta, which is nearly at the bottom of the last little hill; but as a great part of the hill in this place is covered with grass, and even with corn, and the ascent is very unequal, small flat terraces intervening here and there, I was not able to determine the thickness with any thing like accuracy. Gyllenhall states the thickness of the bed of marl-slate to be four feet. In the part of the hill which I examined, there was no possibility of determining the point; because the greatest part of it was covered with grass.

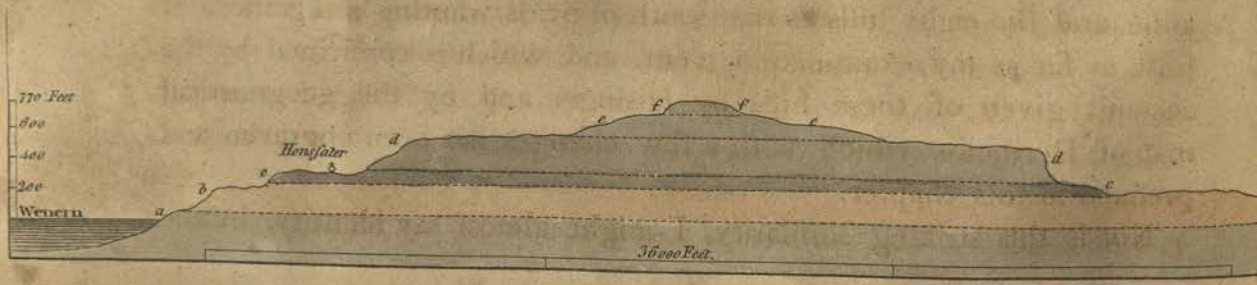
The uppermost rock of all is exactly similar to the rock which crowns the summit of Hunneberg. Like it I consider it as a greenstone; it has a columnar form and many of its pillars have tumbled down and strewed the whole side of the hill. It was very easy to examine it; but I was stopped by a circumstance which was sufficiently provoking; it was so hard, and the edges of it so rounded by the weather, that I was not able to break off good specimens. Though I spent two hours in the attempt, I came away at last without satisfying myself completely. This trap covering is very small when compared with the top of Hunneberg; it does not extend in length above a quarter of a mile, and its thickness cannot much exceed 200 feet.

Billingen, and the cluster of little hills upon the south side of it, are composed of the very same beds with Kinnekülle, lying in the very same order. The quantity of greenstone upon the top of Billingen is considerable; that upon the others is small. This will be best judged of by casting the eye upon the annexed geognostic map of West Gothland, where the different beds are distinguished by different colours.

I did not measure the height of any of these hills; their distance from the lake and their very small apparent elevation rendered such a measurement of little value, unless I had possessed the means of making an observation at the same time on the banks of the lake, and on the top of Billingen. This was impossible, because I was possessed of only one portable barometer. From the top of Kinnecülle these hills appeared scarcely at all elevated above the surrounding country;



# Hill of Kinnekulle.



and from the road at the foot of Kinnekülle they were invisible. It deserves attention that a species of zeolite analysed by Bergman, who published the result of his experiments in the Memoirs of the Swedish Academy for 1784, was found in the greenstone which crowns the top of Mösseberg, one of these hills. This is an additional argument for considering these hills as belonging to the floetz formation. The structure of Kinnekülle, and of course of all the other hills just noticed, will be seen in Plate XIII. fig. 2.

3. The last hill which I have to mention is Lugnos; it is nearly north from Billigen, and lies very near the road side not above seven or eight miles south of Mariestadt. It is so small, and so very little elevated, that it would have escaped my attention altogether had I not been warned of it before hand. It is so little elevated above the surrounding country, that it is not nearly so well intitled to the name of a hill as Richmond hill, and many other similar places in the neighbourhood of London. If we add to this, that it is covered with wood, that it is about two miles long, and nearly one mile and a half broad, it is easy to see with what facility it might be overlooked. This hill is composed of the two lowest beds of Kinnekülle and Billingen, namely *sandstone* and *alum-slate*. This last bed constitutes the summit; it contains, as usual, thin beds of stinkstone, which the people in the neighbourhood burn into lime. There is a representation of this hill in Plate XIII. fig. 3.

Such is an account of the structure of twelve hills, all situated in West Gothland, and scattered over a country about 53 miles long from East to West, and about 41 miles from north to south, all in fact composed of the same beds, lying in the same order, with this singular exception, that the bed of limestone, which is so abundant in Kinnekülle and the eight hills to the south of it, is wanting altogether, at least as far as my examination went, and which is confirmed by the account given of these hills by Hisinger and by the geognostical map of Hermelin, which with a few changes has been engraven and prefixed to this chapter.

Nor is this striking similarity, I might almost say identity, in the

constitution of hills scattered through a country, and lying at a great distance from each other, confined to Sweden. What can be more close than the resemblance between the composition of Arthur's-seat, Salisbury-craig, the Castle-hill, Stirling-castle-hill, the Abbey-craig, and Craig Forth, hills strewed over the flat country through which the river Forth runs? What can be more strikingly similar than the hills which are scattered in the environs of Paris? and which have been so lately described by Brongniart and Cuvier? But certainly no number of hills can be mentioned which have a greater similarity to each other in their structure, than the hills of West Gothland. Shall we suppose, that at one period these beds covered the whole flat country of West Gothland, and that by some unknown cause they have been washed away and removed, with the exception of the twelve hills above mentioned, which from their greater hardness, or from some unknown favourable circumstance in their position, were enabled to resist the force which swept away all the rest? This opinion may appear to many too violent a supposition to be admitted. But that the surface of this globe of ours has undergone the most stupendous and gigantic changes since its original formation, and even since it was inhabited by plants and animals, is a fact too obvious to require proof or admit of denial. The whole flat country of Sweden, even where nothing but alluvial soil appears, is thickly strewed with enormous blocks of gneiss, some nearly as large as a small hill; but all rounded in the edges, and obviously lying over the alluvial soil. Whether we believe with some, that these blocks have been brought from a distance by some enormous torrents of waters; or with others, that they are the remains of rocks of gneiss which formerly covered the country where they lie, but which have been all worn away by time, except these blocks which were enabled by their superior hardness to resist the agency that destroyed all the rest: whichever of these opinions we adopt, and scarcely any other seems conceivable, it is an obvious consequence that the surface must have undergone prodigious changes since the original creation of the earth.

If the latter opinion, which is that of Werner and his school, be con-

sidered as preferable, in that case some modification seems necessary in the Wernerian distribution of rocks. For the coal country in the south of Sweden is as thick strewed with these blocks as any other part of the country. Now as all coal formations belong to floetz rocks, and as this in Sweden possesses the characters of the independent coal formation, we cannot suppose gneiss rocks to have covered it at any former period, without altering our present opinions. Perhaps indeed it will be said that the coal country in Sweden is of so small extent, that the blocks might have easily made their way to it from the neighbouring country to the north, where gneiss rocks still exist in sitû. Nor will I deny that all the blocks of gneiss, which I saw over the coal country in Sweden, were but of a small size, and might therefore have been transported without much difficulty.

The rest of West Gothland, which comprehends the middle of the country, and all that part of it which borders upon the great lakes, is in a geological point of view of little importance. It consists of alluvial soil, partly clay and partly sand, and is thick scattered all over with blocks of gneiss, many of them of immense size. Besides gneiss, I observed occasionally hornblende, felspar, and the other rocks interspersed in the gneiss rocks in beds, occurring also in blocks. This circumstance certainly favours the opinion that these blocks formerly existed in sitû in the state of rocks. The reader will form a tolerably accurate idea of the structure of West Gothland from the map constructed by Baron Hermelin, which accompanies this chapter. Mineralogists in general, and Sweden in particular, lie under very great obligations to Hermelin, for his beautiful maps of the Swedish provinces, which are not only the finest in point of execution, but by far the most accurate that have ever been published in Sweden. Some of them were engraved in London, but others were executed in Stockholm. The execution of both, at least as far as my judgment goes, is nearly equal.

I shall finish this chapter with a list of all the quadrupeds and birds which have been found in the kingdom of Gothland.* This I copy from

* Sweden is divided into three kingdoms or districts; Norrland, Svealand, or Sweden,

a paper, by Mr. Billberg, published in the Memoirs of the Swedish Academy, for 1809. The names employed are the Linnæan. I have added the Swedish names when I happened to be acquainted with them, and likewise the English names by which they are distinguished in this country.

## MAMMALIA.

Nocticolæ. Vespertilio murinus. In Swedish Läderläpping. In English, *Common Bat.*

Feræ..... Phoca Vitulina. In Swedish, Kut. *Common Seal.*
Three varieties occur, viz. α flavescens; β argentea; γ.
Canis vulpes. *Fox.*
Mustela erminea. The *Ermine.*
vulgaris. In Swedish, Risfelvissla. *Weazel.*

Fossores. Erinaceus Europeus. *Hedgehog.*
Sorex araneus. *Common Shrew.*
Talpa Europea. *Mole.*

Glires.... Lepus timidus. The *Hare.*
Mus decumanus. *Norway Rat.*
rattus. *Black Rat.*
musculus. *Mouse.*
sylvaticus. *Wood Mouse.*
paludosus. *Water Rat.*
Sciurus vulgaris. *Common Squirrel.*

Pecora.... Cervus Elaphus. *Stag.*

Bellua.... Delphinus Phocæna. *Porpesse.*

## AVES.

Accipitres. Falco Chrysaëtos. *Golden Eagle.* Very rare.
Albicilla. *Cinereous Eagle.*
Ossifragus. *Sea Eagle.*
Lagopus. *Rough-legged Falcon.*
Rusticolus.
Milvus. *Kite.*
Gentilis. *Falcon Gentil.*
Subbateo. *Hobby.*
Bateo. *Buzzard.*

and Gottland, or Gothland. This last comprehends ten provinces; namely, East Gothland, Smoland, Blekinge, West Gothland, Dahlsland, Bohusland, Halland, Scania, Oland and Gothland. The two last are islands.

Falco Tinnunculus. *Kestril.*
Lanarius. *Lanner.*
Gyrfalco. *Gyrfalcon.*
Æruginosus. *Moor Buzzard.*
Polumbarius. *Goshawk.*
Umbrinus. In Swedish, Ganska Sällsynt.
Æsalon. *Merlin.*
Nisus. *Sparrow-hawk.*
Strix Bubo. *Great eared Owl.*
Otus. *Long-eared Owl.*
Nyctea. *Snowy Owl.*
Aluco. *Aluco Owl.*
Stridula. *Tawny Owl.*
Lanius Excubitor. *Butcher Bird.*
Collurio. *Red-backed Shrike.*
PICÆ..... Corvus Corax. *Raven.*
Corone. In Swedish, Rauk. *Carrion Crow.*
Frugilegus. *Rook.*
Coronæ. *The Roller.*
Cornix. *Hooded Crow.*
Monedula. *Jackdaw.*
Glandularius. *Jay.*
Caryocatactes. *Nutcracker.*
Pica. *Magpie.*
Infaustus.
Coracias Garulla. *The Roller.*
Cuculus Canorus. In Swedish, Gauk. *Cuckoo.*
Yunx Torquilla. In Swedish, Gaukpit. *Wryneck.*
Picus Martius. In Swedish, Tojla. *Great Black Woodpecker.*
Major. Medius. Minor. } In Swedish, Hackspit. *Greater, middle, and smaller spotted Woodpecker.*
Sitta Europæa. *Nuthatch.*
Upupa epops. *Hoopoe.*
Certhia familiaris. *Creeper.*
GALLINÆ .. Tetrao Tetrix. *Black Grous.*
Coturnix. *Quail.*
PASSERES .. Columba Oenas. *Stock Dove.*
Palumbas. *Ring Dove.*
Alauda arvensis. *Skylark.*
pratensis. *Titlark.*

Alauda arborea. *Woodlark.*
trivialis. *Pipitlark.*
Surnus vulgaris. *Starling.*
Turdus cinctus. *Water Ouzel.*
viscivorus. *Missel Thrush.*
musicus. *Throstle.*
piloris. *Fieldfare.*
iliacus. *Redwing.*
merula. *Blackbird.*
Ampelis garrulus. *Waxenchatterer.*
Loxia curvirostra. *Crossbill.*
coccothraustes. *Hawfinch.*
enucleator. *Pine Grosbeak.*
pyrrhula. *Bullfinch.*
chloris. *Greenfinch.*
Emberiza nivalis. *Snow-bunting.*
citrinella. *Yellowhammer.*
schæniclus. *Reed-bunting.*
Fringilla cœlebs. *Chaffinch.*
montifringilla. *Mountainfinch.*
carduelis. *Goldfinch.*
spinus. *Siskin.*
cannabina. *Greater Redpole.*
linaria. *Lesser Redpole.*
domestica. *House Sparrow.*
montana. *Tree Sparrow.*
Muscicapa atricapilla. *Pyed Flycatcher.*
grisola. *Spotted Flycatcher.*
Motacilla alba. Swedish, Longhale. *White Wagtail.*
flava. *Yellow Wagtail.*
boorula. *Grey Wagtail.*
Sylvia luscinia. *Nightingale.*
modularis. *Hedge Sparrow.*
curruca.
hippolais. *Lesser Pettichaps.*
salicaria. *Sedge Warbler.*
cinerea. *White-throat.*
ænanthe. Swedish, Steingylp. *White-ear.*
rubetra. *Winchat.*
phænicurus. *Redstart.*
erithacus.

Sylvia rubecula. *Redbreast.*
troglodytes. Swedish, Tumlingliten. *Wren.*
regulus. *Golden-crested Wren.*
trochilus. *Yellow Wren.*
Parus major. *Great Titmouse.*
cœruleus. *Tomtit.*
ater. *Cole Titmouse.*
palustris. *Marsh Titmouse.*
caudatus. *Long-tailed Titmouse.*
Hirundo rustica. *Chimney Swallow.*
urbica. *House Martin.*
apus. *Swift.*
Caprimulgus Europæus. Swedish, Nattskära. *Night Swallow.*

ANSERES ... Anas cygnus. *Wild Swan.*
tadorna. Swedish, Iugos. *Shieldrake.*
fusca. *Velvet Duck.*
marila. *Scaup Duck.*
anser. *Grey-leg Goose.*
albifrons. *White-fronted Goose.*
erithropus. *Bernacle Goose.*
bernicla. Swedish, Skällgos. *Brent Goose.*
mollissima. *Eider Duck.*
clypeata. *Shoveller.*
platyrhyncos.
strepera. *Gadwall.*
clangula. *Golden-eye.*
glaucion. Swedish, Brunkopp. *Morillon.*
penelope. *Wigeon.*
acuta. *Pintail Duck.*
hyemalis. Swedish, Aller. *Long-tailed Duck.*
ferina. *Pochard.*
querquedula. *Garganey.*
crecca. *Teal.*
rufa. *Red-breasted Shoveller.*
boschas. *Wild Duck.*
fuligula. *Tufted Duck.*
stelleri.
Mergus merganser. Swedish, Skräcka. *Goosander.*
serrator. *Red-breasted Merganser.*
albellus. *Smew.*
Alca torda. Swedish, Tord. *Razor-bill.*
Pelicanus carbo. Swedish, Olkroka. *Corvorant.*

Columbus arcticus. *Black-throated Diver.*
septentrionalis. *Red-throated Diver.*
stellatus. *Speckled Diver.*
Uria grylle. *Black Quillemot.*
Podiceps auritus. *Eared Grebe.*
Larus glaucus. *Blue Gull.*
marinus. *Black-backed Gull.*
fuscus. *Herring Gull.*
canus. *Common Gull or Sea Maw.*
ridibundus. *Black-headed Gull.*
minutus. *Small Gull.*
Catoracta parasitica. *Arctic Gull.*
Sterna hirundo. *Common Tern.*
nigra.
minuta. *Lesser Tern.*

GRALLÆ .. Ardea grus. *Crane.*
ciconia. *White Stork.*
cinerea. *Common Heron.*
Tantalus falcinellus. *Bay-ibis.*
Numenius arquata. *Curlew.*
phæopus. *Whimbrel.*
Scolopax fusca. *Brown Snipe.*
rusticula. *Woodcock.*
gallinago. Swedish, Russgauk. *Common Snipe.*
glottis. *Greenshank.*
totanus. *Spotted Snipe.*
limosa. *Iadreka Snipe.*
lapponica. *Red Godwit.*
canescens. *Cinereous Godwit.*
Tringa pugnax. Swedish, Purrhöns. *Ruff and Reeve.*
vanellus. Swedish, Bläcka. *Lapwing.*
interpres. Swedish, Tolk. *Sea-dottrel.*
ocrophus. *Green Sandpiper.*
alpina. *Dunlin.*
glareola. *Wood Sandpiper.*
littorea. *Sea Sandpiper.*
hypoleucus. *Common Sandpiper.*
cinclus. *Purre.*
squatarola. *Grey Sandpiper.*
Charadrius hiaticula. *Ringed Plover.*
morinellus. *Dottrel.*
apricarius.

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FALCO UMBRINUS.

Charadrius pluvialis. *Golden Plover.*
Recurvirostra avosetta. *Scooping Avocet.*
Hematopus ostrolegus. *Pyed Oystercatcher.*
Fulica atra. *Bald Coot.*
chloropus.
Ralluscrex. *Crake.**

I shall terminate this catalogue with a description of the *falco umbrinus,* a species of eagle not found in Great Britain, and very rare in Sweden.

It is about the size of the *falco palumbarius* or goshawk. From the tip of the beak to the end of the tail is about 22 inches. The distance between the extremities of the wings when stretched is about $3\frac{1}{2}$ feet. The beak is curved, and of a leaden colour, moistened with wax. The upper maxilla furnished with an obtuse tooth. Iris clay-coloured. A white line above the eyes. The temples and *nucha* spotted with white. The neck, the back of the wings, the *tectrices* and *uropygium* ash-grey. The margins of the feathers yellow. The gullet white, as likewise the inferior part of the neck, but variegated with ferruginous stripes.

Body below white, with numerous dark coloured longitudinal spots. The spots on the sides inclining to heart-shaped. The wings below white, longitudinally marked with dark spots. The end feathers ash-coloured. The interior margins surrounded with a white border. Tail long, equal, marked above with eight or nine yellow transverse lines: below ash-coloured with a white border. Feet leaden-coloured; thighs covered with feathers; legs covered with a silky down; talons ash-coloured above.

It is more nearly allied to the falco palumbarius and gentilis than to any other birds; yet it is distinct from them, as is evident from the description, nor can it be considered as a younger variety of any other species. It differs from the former in colour, and in the lines, and ob-

* This list does not contain nearly all the animals in Sweden. The *wolf,* for example, is omitted. I saw at Stockholm all the Swedish birds in the Museum of the Academy. They amounted to nearly 300 species.

long spots upon the body, in the yellow colour of the tail, and the white band with which it is surrounded below. The same marks distinguish it from the *falco gentilis.* We have given a figure of this bird in Plate V. from which the reader may form an adequate idea of its appearance.

Geognostic
MAP OF
NERIKE.
Reference
Gneiss
Floetz tract
Clay
Alum slate
Sand stone
Floetz lime
Primitive lime
Iron mine
Ditto, forsaken
Sand
Sulphur
Churches
Forges
Smelting houses
Farm houses
Post houses
English Miles
Swedish Miles
WESTMANLAND
CARLSKOGA
FELLINGSBRO HARAD
GLASSHAMMARS HARAD
BERGSLAG
OREBRO
HARAD
ASKERS
EDSBERG
SKYLLERSTA
HARAD
KUMLA
GRIMSTEN
SKAGERN
SUNDBO
HARAD
HARAD
HARAD
UNDEN
SODERMANLAND
EAST GOTHLAND
WERMELAND
Engraved by J. Storer for H. Thomson's Travels in Sweden. Published May 1st 1813.

# CHAPTER IV.

## JOURNEY THROUGH NERIKE AND WESTMANLAND TO STOCKHOLM.

Account of the constitution of Nerike—Iron Mine of Hesselkulla—other Mines—Uncommon Frost—Tobacco—Potatoes—Malefactors hung in chains—Swedish camp—Stopped by a Custom-house Officer—Description of Orebro—The Diet—House of Nobles—Clergy—Peasants—Burghers—Anomaly in the Swedish Constitution—Strange Laws enacted by the Peasants—Manufactures—Rocks between Orebro and Arboga—Arboga—Köping—Anecdotes of Scheele—Vesteros—Cathedral—Monuments—Fate of King Eric XIV.—Country between Vesteros and Stockholm—State of Agriculture in Sweden.

NERIKE, into which we entered at a place called Bodarne, at no great distance from Mariestadt, is one of the most beautiful provinces in Sweden. The southern and western parts of it consist of low ridges of gneiss rocks, divided from each other by intervening valleys. These parts are similar to the same divisions of West Gothland, with this difference, that the gneiss rocks in Nerike are not so high nor so abrupt in their terminations as those of West Gothland, and that beds of primitive limestone occasionally occur in them. The central and northern parts of Nerike are quite flat, and consist partly of alluvial soil, often loose sand, thickly scattered with enormous blocks of gneiss, and partly of floetz beds, which, as far as I was able to examine their structure, had a striking similarity to the twelve floetz hills in West Gothland described in the last chapter. That is to say, that immediately over the gneiss, which I conceive to constitute the basis of

the whole country, there lies a bed of sandstone; over the sandstone lies a bed of alum-slate; over the alum-slate, and constituting the uppermost bed in the district, lies a bed of limestone. This consitution of the floetz part of Nerike is represented in Plate XIII. fig. 4. The reader will be able to form some notion of the structure of Nerike from the geological map by Hermelin, which we have prefixed to this chapter.

I was informed that rocks of mica-slate make their appearance in the southern parts of Nerike, but as I did not visit any of the spots where these rocks are to be seen, and indeed was not aware of the circumstance till after I had left the district altogether and gone to Stockholm, I had no oportunity of verifying these accounts by my own examination.

There are several mines in Nerike, chiefly iron mines. They are situated in the floetz tract, but very near the gneiss rocks, which may be traced within a few miles of them. The most remarkable of these mines lie near Vinterosa, upon the banks of the Black River which runs into the lake Hjelmar; it is called Hesselkulla. The ore is a magnetic ironstone; the veinstones are quartz, garnet, lime, and felspar. Hence I conceive this mine to lie in the gneiss; though from the nature of the country it is scarcely possible to determine the point by actual inspection. But the gneiss may be seen distinctly within less than an English mile of the mine. The limestone is sometimes crystallized, and the most usual varieties of the crystals are the *chaux corbonatée dodecahedre & metastique* of Haüy. Fluor spar occurs in this mine, a circumstance that deserves to be mentioned, because it is a rare mineral in Sweden. It was from this mine also that a mineral analysed by Ekeberg, and considered by him as a species of *natrolite,* was obtained. It has no resemblance to the natrolite of the Germans. At first sight it has a striking similarity to felspar; but whether it possesses the real characters of that mineral I have not yet assertained. This is one of many points left for decision till my specimens arrive. Its colour is greenish-grey; it is not crystallized, but is distinctly foliated, and exhibits a double

cleavage. So that there is reason to believe that its primitive form may be made out with tolerable accuracy. It scratches glass but is scratched by felspar; its specific gravity is 2·746. It melts before the blowpipe with difficulty into a semitransparent globule. According to the analysis of Ekeberg its constitutents are as follows:

| | |
|---|---|
| Silica | 46·00 |
| Alumina | 28·75 |
| Lime | 13·50 |
| Oxide of iron | 0·75 |
| Soda | 5·25 |
| Water | 2·25 |
| | 96·5 |

The result of this analysis is sufficient to shew us that the mineral in question is not natrolite. The great proportion of lime is equally inconsistent with the opinion that it is a variety of felspar. The loss of weight, which is uncommonly great, was probably owing either to a portion of soda which escaped, or to an acid which was not suspected.

There is another iron mine in the neighbourhood called Sanna, remarkable for the great quantity of arsenic pyrites which it contains.

There were formerly some other iron mines in the neighbourhood of Örebro; but they have been abandoned for some time.

To the north of Örebro about ten miles, at a place called Dylta, there is a depôt of pyrites lodged in a quartz rock. From this pyrites sulphur is separated by means of heat. There is a work erected for the distillation of the pyrites and the obtaining of the sulphur. The process followed is very simple: the pyrites is exposed to heat in a kind of low chamber from which there runs a long flue along the surface of the earth, this flue is lined with wood; when the process is at an end, the upper covering is removed, and the sulphur swept out. It is afterwards melted and cast into rolls.

A little to the north of Vinterosa, at Tyslinge, upon the borders of a small lake, the structure of the floetz part of Nerike, such as I have described it, may be distinctly seen. Every person that examines this

spot will be struck with the great resemblance which it exhibits to the floetz hills in West Gothland described in the last chapter.

After passing by the Svarton, a small river that runs through Örebro and falls into the lake Hjelmar a little below it, the primitive rocks again make their appearance. They are partly gneiss, but near the church of Glanshammar I observed a bed of mica-slate; which, as far as I could trace it, appeared to run south-east, and to lose itself in the lake Hjelmar not far from Lillkyrka. These primitive rocks continue quite through Nerike, which terminates at Arboga; and indeed, with a few slight exceptions, they may be said to continue all the way to Stockholm.

I got specimens of cobalt ore at Stockholm, which I have reason to believe came from Nerike; but I am ignorant of the particular spot where this cobalt mine exists. The owners of it are in the habit of selling their ore as Tunaberg cobalt, and on that account are shy about giving any information respecting it. Hence this mine is not mentioned in any of the mineralogical accounts of Nerike that I have seen.

The greatest part of Nerike is covered with forests of pine and birch. The roads are in general sandy, and nothing is more common than to see sand and gravel pits along their sides. So that if you merely travel along the road without making occasional excursions to interesting spots, you in reality see nothing, and would be apt to conclude, that the whole country was a bed of loose sand thickly scattered with blocks of gneiss. But nothing would be more inaccurate than this idea, as will be obvious to any one who will cast his eye upon the geological map of the province which accompanies this chapter.

We travelled through the first part of Nerike with considerable rapidity. But through the last part of it, which is by far the most beautiful and picturesque, our progress was slow, so that we had sufficient leisure to take a survey of every thing which seemed worthy of attention.

During this part of our journey, though it was only the beginning of September, we had four days of as cold weather as usually occurs

in Sweden at the end of November. The frost in the night was strong, and all the fields of potatoes, which had been in blossom a day or two before, were quite withered and destroyed; the same change was produced upon the tobacco fields. This plant is cultivated to a considerable extent in Sweden, where every body smokes with scarcely a single exception, and where the pipe is as constant a companion on a journey as a staff or a great coat in this country. Nothing was more common than for our post boys to smoke their pipes during the whole time of the stage; and not unfrequently, when the day happened to be a littly windy, they chose, of their own accord, to sit behind the carriage, that they might not incommode us with the smoke.

These four cold days, produced by the blowing of a keen north east wind, totally altered the face of the country, and made the fields all at once put on the appearance of winter. The rye and the big were mostly ripe; but a great proportion of the oats were still green. They acquired a white colour, indeed, in consequence of the action of the frost, but they would neither ripen nor even be completely filled; so that the crop of oats, at least in the parts of Sweden about the latitude of 60°, would be in a great measure lost. This was not only an injury to Sweden, but an injury likewise by reflection on Great Britain; for a considerable proportion of Swedish oats used to be transported to Great Britain. The want of such a supply at a time like the present, when our supplies from other quarters are in some measure cut off, must be more severely felt than usual.

The loss of the potatoe crops in Sweden is not of so great consequence as may at first sight be imagined. The quantity of potatoes planted is not very considerable, nor is this admirable root so much relished by the Swedes as it ought to be. The potatoes in Sweden, owing, I presume, to the kind planted and to the mode of cultivation, are all very small, scarcely larger than the usual size of the potatoe apple in this country; they are never mealy, but always waxy, because that is the kind of potatoe most relished by the Swedes. Though the smallness of their size and their waxy appearance rather

prejudiced me against them at first; yet I found their taste very agreeable, and was soon quite reconciled to them. How they would keep through the winter was with me a dubious point, for they had both the taste and appearance of not being fully ripe.

The tobacco is planted in very small patches, and one of these is attached to almost every house. When the leaves have reached their proper size and age, they are pulled off and treated pretty much as they are in Virginia. In the year 1812, a very great proportion of the crop must have been lost; for I saw many fields in which the tobacco leaves were quite black and shrivelled.

About two miles before we reached Örebro, in an opening in the wood on the south side of the road, we saw the remains of two malefactors hung in chains: one of them was a soldier, and the other a countryman of Nerike. They had murdered a Swedish boy, a pedlar, who had treated them with brandy in a publick house, and unluckily pulled out a bunch of bank notes to pay the bill; the two men followed the boy and demanded his money, he told them that he had little enough for himself, and therefore, could not spare any for them; upon this they knocked out his brains and made off with their booty. They were soon after seized, tried, and condemned for the murder. The usual mode of punishing murderers in Sweden is to cut off the head and right hand at one and the same time. The only other instance, which occurred to me in Sweden of a criminal hung in chains, was on the road side a considerable way to the north of Sala, in Westmanland. This criminal had been beheaded about a year before for the murder of his own father. It would seem to be the custom in Sweden to hang in chains all those criminals that are executed for murder. Two instances being all that occurred to me in travelling over a very considerable portion of the country, we see that this odious crime, so common in some of the southern parts of Europe, is very uncommon indeed in Sweden.

A little to the west of Örebro, there was a camp of Swedish soldiers. The number did not appear to exceed a regiment. When we came to the bridge, at the west end of the town, we were stopped by two

soldiers who were upon guard at the end of the bridge. They conveyed us across the bridge, and delivered us over to two other soldiers, who marched by our side to a house a little way on, where was the officer upon guard. He came out, demanded our passports, and after having perused them, allowed us to go on.

This ceremony, which detained us about five minutes, appeared to me at first useless, if not ridiculous. It was probably intended as a lesson of duty to the soldiers upon guard. How the Swedes, who consider themselves as a free people, and really seem in many respects entitled to the name, can reconcile such ceremonies with freedom it is difficult to say. What a sensation would it produce in Great Britain, if a regiment of soldiers were to take possession of one of the great roads leading to Liverpool or Birmingham (for Örebro is in Sweden what these towns are in Britain, in proportion to the capital), and allow no persons to pass till they had ascertained where they were going and what was their object.

I was still less pleased with another ceremony which we were obliged to go through, just as we reached the gate which constitutes the beginning of Örebro. Here we were stopped by a custom-house officer, who informed us that it was his duty to examine our baggage. Upon inquiry we were informed by our servant that such officers were placed at the entrance of all the considerable towns in Sweden; that it was customary for travellers to give them a little money, in consideration of which, they waved the ceremony of examining the baggage, and allowed the carriage to proceed. We gladly embraced this alternative; for the necessity of unloading all our baggage, and exposing it in the open street, appeared to us very hard. What the use of such custom-house officers can be it is very difficult to determine. As they hardly ever examine the baggage, they can be of no use in preventing illicit articles from being introduced into the town, even supposing this to have been their original intention. Such a practice comes to neither more nor less than imposing an arbitrary tax upon travellers, at the entrance into every town. But as this tax is put into the pockets of the collectors, who might have been more usefully employed some

other way, it can in fact be of no service whatever to government. These custom-house officers constitute one of those useless nuisances which exist in such numbers in almost every country. They are not confined to Sweden; but abound in every country of Europe except Great Britain. It was probably our happy freedom from this abuse that made me sensible of its impropriety. Had I been accustomed to it from my infancy it might have escaped altogether without notice, as it probably does with those Swedish travellers who have been all their lives exposed to it.

We arrived at Örebro in the evening, and spent the greatest part of the next day in taking a survey of that town and its environs. There is a pretty large tavern in the principal square of the town; but upon sending to inquire, we were informed that no lodgings were to be had in it, and were obliged in consequence to stop all night at the post-house, a circumstance rather disagreeable, and never to be done in any town in Sweden when it can be avoided. Our carriage wheel, which was too weak at first, and which had begun to give way a few miles before we reached Örebro, required to be mended. This was an additional reason for stopping a day at Örebro.

Örebro is reckoned the fifth town in Sweden in point of size: Stockholm, Gottenburg, Norköping and Carlscrona being the four that are before it in point of population. But for my part, as far as I could judge from walking through both, Westeros seemed of a greater size than Örebro. But it is perhaps impossible to form an accurate judgment of the size of two places by merely walking through them. In the year 1802 the number of inhabitants in Örebro was 3242, and the number of houses 753. I was told that at present the number is somewhat greater, amounting to nearly 4000; but how far the accuracy of this account can be relied on I do not know. Akrell states the number at 5483; but he obviously includes more than the mere inhabitants of the town. Örebro lies upon the Svartan (Black River) or the Nästa, as the river is called at Örebro. This river is of a considerable size, though quite unfit for the purposes of navigation. After entering the town it divides into two branches, which after surrounding a small island

unite again at the lower part of the town. The principal street called *Stora Gatan* (great street) runs nearly north and south. There are two squares. The streets are wide and regular, and paved with round pieces of granite. The houses are all of wood, commonly painted red, and two or three stories high. The Governor's house is situated in the island. It is a very large house with four round low turrets, one at each corner. The south side of it is the prison. The river runs into the lake Hjelmar, from which the town is not farther distant than two English miles. This lake is united to the Mälar, by the canal of Arboga, which enables the inhabitants of Örebro to carry on a considerable traffic with Stockholm.

Örebro is the place where the Swedish Diet occasionally meets; a circumstance which gives it more importance than it otherwise would be entitled to from its size. The Diet, as is well known, is the supreme court in Sweden, and similar in many respects to the Parliament of Great Britain. It consists of four distinct bodies of men, who meet in separate houses. These are—the Nobles, the Clergy, the Peasants, and the Burghers or inhabitants of towns.

1. There are three orders of nobility in Sweden, Counts, Barons, and Noblemen without any title. When a family is once enobled, all the descendants and collateral branches are noble. So that the number of noblemen in Sweden must increase with the population of the country. The number of noble families in Sweden amounts to about 1200. In the year 1802, before the separation of Finland, the number of nobility in Sweden were as in the following table:*

| Married. | | Widowers. | Widows. | Unmarried above 15 years of age. | | Do. under 15 years of age. | | Total. |
|---|---|---|---|---|---|---|---|---|
| Males. | Females. | | | Males. | Females. | Males. | Females. | |
| 1716 | 1788 | 294 | 908 | 1795 | 2052 | 1770 | 1734 | 12057 |

I do not know exactly what allowance to make for Finland. But it is obvious that notwithstanding the great difference in point of population the number of nobility in Sweden is nearly twelve times as

* This and the two following tables of a similar nature are copied from the Memoirs of the Swedish Academy, for the year 1808.

great as in the whole of Great Britain and Ireland. Hence the great power of the nobility. Sweden is in fact a great aristocracy. To this may be ascribed the unsteadiness of the government, and the numerous revolutions to which it has been subjected. The nobility all possess the same general privileges, which consist in an exemption from the poll-tax, and in the capacity of holding various civil employments about the king's person and court, which cannot be filled by any of the lower orders. The head of every noble family is a member of the Diet, and represents the whole of his family. So that the number of noblemen who have a seat in the Diet amounts to about 1200.

2. The second House of the Diet consists of the Clergy. The religion in Sweden is the Lutheran: and the different orders of clergy are bishops; *domprosts* or deans; *prosts* or archdeacons; *pastors* or rectors; and *comministers,* or perpetual curates. There are twelve dioceses; namely, one archbishopric and eleven bishoprics. These are the archbishopric of Upsala, and the bishoprics of Hernösands, Strängnäs, Vesteros, Carlstads, Linköping, Kalmare, Vexio, Skara, Gottenburg, Lunds, and Visby. There are 170 archdeacons, and 3,620 rectors and perpetual curates. Before the separation of Finland from Sweden, the whole of the clergy, including women and children, amounted to 19201.

The representatives of the clergy consist of the twelve bishops who are members of the Diet, *ex-officio,* and a certain number of ecclesiastics who are elected by the rest. When the king's writ for the meeting of the Diet is issued, the ecclesiastical court of each diocese sends a circular letter to the archdeacon of a district having the right of election, who communicates the summons to the clergymen of the different parishes. Every person possessed of a benefice, and all the masters of the royal schools, have the right both of electing and being elected. The election is decided by a majority of votes. The bishops are usually paid from fifteen shillings a day to ten shillings; and the inferior clergy from six shillings to five shillings during the continuance of the Diet, by the diocese and the members of the district which has elected them. The number of representatives of the clergy is uncertain, because each district may either send up a representative

of its own, or join with the neighbouring district and send one between them. They usually vary from fifty to about eighty.

3. The third House of the Diet consists of the Peasants, a class of men that do not exist at all in Great Britain, and therefore require to be particularly explained. In Sweden there is no class of men equivalent to our British farmers; that is to say, men who pay a certain annual rent to the proprietor of the farm, in order to be allowed to cultivate it. The only farmers in Sweden are either proprietors of the land, similar to our country gentlemen, or they are peasants. Now a Swedish peasant is a man employed in agriculture, possessing land of a certain tenure, who has never followed a trade nor enjoyed a civil office. So that a peasant is a man whose ancestors have been always farmers. Neither a nobleman, citizen, or country gentleman, though he may purchase the peasant's estate, is considered as a peasant; nor is he entitled to be elected a representative of the peasants, nor to vote at such an election. The land qualifying a peasant to vote must be either crown land or his own property. The value of such lands of course must differ enormously.

Before the separation of Finland from Sweden, the whole body of peasants including doubtless their servants, amounted to the numbers contained in the following table:

| Married. | | Widowers. | Widows. | Unmarried above 15 years of age. | | Do. under 15 years of age. | | Total. |
|---|---|---|---|---|---|---|---|---|
| Males. | Females. | | | Males. | Females. | Males. | Females. | |
| 437802 | 438540 | 34602 | 102214 | 302816 | 314616 | 423038 | 424977 | 2,478,605 |

But nearly a third part of this number must be subtracted in consequence of the separation of Finland.

The peasants may be divided into two classes. 1. Those who are possessed of crown lands, which they enjoy for life, on the payment of a certain quit rent. On the death of such a peasant the lease is almost always granted to his eldest son. 2. Peasants who have bought the perpetuity of their farms, either from the crown or the nobility, at six years purchase, on the payment of a quit rent. So that Swedish pea-

sants are not in fact proprietors of the lands which they hold. What is called in Scotland a few, and in England a copyhold, is very similar to their tenure. Nothing can be more striking than that the very circumstance, which in Great Britain disqualifies a man from being elected, or even voting at an election, should in Sweden constitute the exclusive title to these two privileges. Every peasant may be elected a representative; but a certain value of land (not less than 30*l.*) is necessary to constitute a vote. If this land is divided among two or more peasants they enjoy one vote among them.

The peasants are elected in the following manner: the governor of the province sends the writ to the county judges, who summon the peasants within their respective jurisdictions to meet in the court of justice on the day of election. The members are chosen by a majority of votes; the electors pay their constituents from three to five shillings a day during the sitting of the Diet; the number of representatives is uncertain. Each district may send two deputies; or two districts may unite together and send only one. In general the House of Peasants consists of about 100.

4. The fourth House of the Diet consists of the Citizens. The number of towns in Sweden amounts to about 100. Every freeman of these towns, who pays taxes to the town, and has reached the age of twenty-one, is an elector. Every citizen who has been a freeman for seven years, or an alderman for three, and reached the age of twenty-four, may be elected. The number of freemen bears but a small proportion to the inhabitants of the towns. Before the separation of Finland their number was as in the following table, and as Finland contains but few towns, the number at present will not be much diminished:

| Married. | | Widowers. | Widows. | Unmarried above 15 years of age. | | Do. under 15 years of age. | | Total. |
|---|---|---|---|---|---|---|---|---|
| Males. | Females. | | | Males. | Females. | Males. | Females. | |
| 14450 | 14544 | 1314 | 4585 | 8340 | 8332 | 11863 | 12784 | 76,212 |

Stockholm is in the habit of electing ten representives. Some of the largest of the other towns, as Gottenburg, Norköping, Geffle, &c.

elect three, and all the other towns have the right of electing two. But as two or three of the smaller towns often join together to elect only a single representative, the total number of representatives of the citizens is somewhat uncertain. It seldom falls short of one hundred, and hardly ever exceeds two hundred.

Each of these Houses constituting the Diet meets in a distinct place. We visited the house at Örebro where the peasants meet. It was a long low room, seated somewhat like a school. Each member in every house has the power of proposing a law: a debate ensues. If the proposal be carried by a majority it is sent to the other houses; and if three out of the four approve of it, the resolution is laid before the king for his assent. After which it passes into a law.

It is a great anomaly in the Swedish constitution, and a great injury to the country, that the country gentlemen, who have the greatest stake in the country, and who ought from their situation and the education which they receive to have the greatest quantity of knowledge, are neither represented in the Diet as a body, nor can they be elected members of any of the four Houses of which the Diet consists. This anomaly ought to be rectified. It would have a tendency to increase the number and respectability of the middling ranks of society, which constitute the great stay and bulwark of every country, and which in Sweden are not sufficiently numerous to have their due weight. It is not so much to the laws and constitution of Great Britain, that her power and prosperity is owing, as to the very great proportion which the middle rank bears to the two other classes. A proportion far greater than in any other country in Europe, and constituting Great Britain in consequence the first country in the world. It is very difficult to account for the origin of this great proportion of the middle ranks in Britain. But the whole merit of it belongs to England. Before the union there was scarcely any middle rank at all in Scotland. If the proportion in that country be not inferior to what it is in England at present, as I believe it is not, we must ascribe it to the union, and to the consequent improvements in manufactures and agriculture, which have advanced in Scotland with unexampled rapidity. Even at present

the middle ranks in Ireland bear but a small proportion to the highest and lowest classes. Let us hope that the union will remove this defect, and with it put an end to all the grievances and discontents which the Irish still continue to feel.

It is the common opinion in Sweden that the nobility, who are the most powerful class, have in a great measure the command of the Diet. This is probably the case in general; but some laws exist in Sweden of so very strange a nature that they could scarcely have originated any where else than with the peasants. I shall mention one or two which I found on particular occasions rather inconvenient for myself. There is a law lately enacted, that when a party take post-horses they must take as many horses as there are individuals of the party, otherwise the post-boy is at liberty to refuse to drive, and to take his horses home again. When I was at Helsingburg, I wanted to visit the coal-mine which was about eight miles off. I ordered from the post-house a single horse-cart, which (not being aware of the law) I thought quite sufficient for myself and my servant. After I had taken my seat in the cart, I called to my servant to come up also. But the post boy informed me that he could not go. When I insisted on the necessity of his going as an interpreter, the boy burst into tears, and insisted upon taking home his horse and carriage. On inquiring into the meaning of this apparently unaccountable conduct, I was told of the new law, and found myself in consequence obliged to dismiss the post boy and his carriage, and order another cart with two horses. I got it after waiting about four hours, and then was allowed to take my servant along with me. This ridiculous law could only have been suggested by the peasants who have a monopoly of posting, in order to increase their own emolument.

Another new law, which smacks equally of the peasants, is that you are not at liberty to drive post horses at a greater rate than about five English miles in the hour. This law, however, is not so easily kept as the other. We generally contrived to post at a greater rate; but the consequence was frequent and disagreeable quarrels between our servant and the post boy: the one insisting on driving on, while the other as eagerly detained the horses.

Örebro had formerly been a manufacturing town, and famous throughout Sweden for its fire-arms, cloth, and tapestry. But we could find hardly any remains of these manufactures after the most diligent inquiry. On asking for the manufactory of fire-arms, we were carried into a small room where we saw an old man and three old pistols. On asking for the cloth manufactory, we were taken to the house of industry, where we found fifty boys and girls employed in spinning wool. We admired the fineness of the thread which they span, and the cleanness and neatness of the place. In short all its manufactures seem to have completely abandoned Örebro. Though there are still some iron forges in the neighbourhood, together with an alum work and a sulphur work at no great distance. Its advantageous situation for water carriage, and the beauty of the neighbouring country, must always make Örebro a place of importance in Sweden.

We left Örebro about three o'clock on the 2d of September, and went that night as far as Arboga, a distance of $4\frac{1}{2}$ Swedish, or thirty English miles. The stages were—

| | Swedish miles. | English miles. |
|---|---|---|
| Glannshammar | 1·5 | 10 |
| Fellingsbro | 1·75 | $11\frac{2}{3}$ |
| Arboga | 1·25 | $8\frac{1}{3}$ |
| | 4·5 | 30 |

The road was sandy, and passed through an alluvial country till we came to Glannshammar, where we again entered into primitive strata. The rocks though low were numerous and sufficiently distinct. This kind of country continued till we came to the river Röforssbruk, or Arboga, as it is also called, which runs through the town of Arboga, and passes into the Mälar, a little below it. Between this place and Arboga, the road lies upon the north side of the river. I had not an opportunity of examining the rocks particularly; but have no doubt that they are primitive and similar to those through which we had just passed.

Arboga, though very small, is a very beautiful spot. The country round it is delightful, and not inferior to any other part of Sweden. A

little below it the lakes Hjelmar and Mälar, are united by means of the canal of Arboga, which connects Örebro with Stockholm, and adds greatly to the means of intercourse between Nerike and the capital. I consider Arboga as the termination of Nerike. We now entered Westmanland, and passed through a considerable portion of it, and of Upland, before we reached Stockholm. But I shall not at present attempt to give an account of the minerals of these counties. I travelled through them a second time, for the express purpose of forming a correct notion of their structure, and think it better to defer all my mineralogical remarks till I come to relate that journey.

We left Arboga about half past four in the morning. Our first stage of $1\frac{1}{2}$ Swedish, or ten English miles, brought us to Köping, a small market town upon a small rivulet that runs into the lake Mälar, a little below the town. Though Köping be one of the poorest and most insignificant towns in Sweden, I viewed it with particular interest as the place where Scheele finally settled as an apothecary, and where he died in 1786. I need not tell my readers with how much attention I surveyed the house in which he had lived, and where he died. I was very minute in my inquiries about Scheele, and from Assessor I. G. Gahn, at Fahlun, who was his intimate friend, and who showed me a collection of letters that he had received from him, I learned several particulars which are not generally known, and which therefore I shall state here.

Scheele came over to Helsingborg, and after his apprenticeship was at an end, he went first to Stockholm, and then to Upsala. From the very commencement of his career, the whole bent of his mind was towards chemistry. He never thought nor talked of any other subject. The knowledge that he had acquired, long before he became known to the world at large, was greatly above that of any of his contemporaries. Mr. Gahn's acquaintance with him began by an accident. He went one day into an apothecary's shop at Upsala, who knowing him to be a chemist, and to be intimate with Bergman, asked him to explain a difficulty which had lately occurred to him. The apothecary had accidentally mixed together a quantity of saltpetre that had been exposed

for some time to a red heat and cream of tartar. The instant the mixture was made, a smell of nitric acid became very perceptible. So that in this case it would seem that tartaric acid, contrary to the usual affinities, had disengaged nitric acid from potash. The apothecary wanted an explanation of this anomaly. Mr. Gahn was unable to give any satisfactory account of it; and on stating the case to Bergman, the professor was equally at a loss for an explanation. A few days after Mr. Gahn went back to the same shop to acknowledge his inability to solve the difficulty. He found a young sombre looking man behind the counter, who told him that the apparent anomaly was easily explained. "Nitric acid," said he, "like sulphuric is capable of existing in two states. In the first state it has a stronger affinity for potash than tartaric acid, but in the second state it has a weaker. By exposing nitre to a red heat the acid is changed from the first to the second state. Hence it ought to be separated by tartaric acid, as turns out to be the fact when the experiment is tried." This young man was Scheele. Thus their acquaintance began, and it soon ripened into friendship.

Before this period Scheele had written a dissertation on the tartaric acid, which he had sent in manuscript to Bergman, who was professor of chemistry at Upsala, and the man of the greatest chemical reputation in Sweden. The name of Scheele at this time was unknown to Bergman. He merely looked at the title of the manuscript, and perceiving that it treated of a subject which had been already handled by Margraff, took it for granted that it would contain nothing new, and therefore set it aside without reading it. Scheele felt indignant at this treatment. He sent another copy of his manuscript to Retzius, at that time a professor in the university of Lund. Retzius soon after published this treatise as his own, without so much as mentioning Scheele's name; and the curious discoveries contained in it were for a considerable time ascribed to Retzius by the chemical world. Even the Stockholm Academy fell into this natural mistake. I do not know whether the preceding anecdote has been before published; but it ought to be gene-

rally known, not only that the character of Retzius may be properly appreciated; but that the curious discoveries respecting tartaric acid may be ascribed to their true author.

In consequence of this negligence on the part of Bergman, Scheele was very much offended. He was not willing to ascribe it to the true cause, inadvertence; but thought it rather proceeded from the pride of station and from supercilious contempt. It was with much difficulty that Mr. Gahn prevailed upon him to allow himself to be introduced to Bergman. But after the ice was once broken, they became intimate and inseparable friends.

Scheele all his life long was constantly sighing for independence; and as his ambition was not high it was easily gratified. On the death of an apothecary at Köping, he agreed with the widow of the deceased to succeed him in the business. At first his circumstances were straitened. To abstain from chemical experiments was impossible; but they were made in an open room for want of a better. In this way he continued for several years, and caught in consequence violent rhumatisms, which at last terminated fatally. Though towards the end of his life he was able to fit up a comfortable laboratory, the malady had been already contracted, and he fell a sacrifice to it in the year 1786.

Scheele was certainly the most astonishing chemist, and one of the most extraordinary men, that ever existed. Very little progress had been made in discovery till he began his career. Every thing remained unexplored, even the proper mode of proceeding required to be invented. He started up all at once superior to all his contemporaries, with views more extended, and industry more persevering and invincible. Every dissertation produced a discovery, and altered and extended the chemical horizon. It is not too much to say that almost every chemical discovery published in Sweden during his life-time originated with Scheele. It is well known that he was a German, and that he could not use any other language with facility. His papers were all originally written in German, and translated into Swedish by somebody or other, before they were published. I do not know whether he even under-

stood English and French. As he never enjoyed a liberal education, and spent his life-time behind an apothecary's counter, it is more than probable that he did not.

We stopped to breakfast at Vesteros, and as our unfortunate carriage wheel had again given way, we were obliged to spend the greatest part of the forenoon in this place, in order to get it repaired. I took advantage of the opportunity to take a survey of the town and environs.

Vesteros lies upon the side of the lake Mäler, and in consequence of this favourable situation it is the great medium of intercourse between a considerable part of Westmanland and Dalecarlia and the capital. Hence it is a thriving place, and enjoys a good deal of trade. To the eye it appeared fully as large as Örebro; but the number of inhabitants I was told is not so great, amounting to scarcely 3000. The town is inferior in beauty to Örebro; the streets are narrower, less regular, and more dirty, and the houses upon the whole are not so elegant. As is the case in all the small towns in Sweden, they are constructed wholly of wood, except the church, which is almost every where of brick or stone.

Vesteros is the seat of a bishop, and said to be the richest see in Sweden. The revenues are stated to amount to about 1000*l.* a year. The cathedral which I visited is a simple but elegant building, and, like all the Swedish churches, remarkably clean within. It contains several monuments: among others a very elegant porphyry monument erected to the memory of King Eric XIV. by the late King Gustavus III. The history and catastrophe of Eric is known, I presume, to many of my readers.

He was the son and successor of Gustavus Vasa, and one of the most learned and accomplished princes of his time. But he seems to have been subject to occasional fits of insanity, which disqualified him for discharging the duties of a king. His foreign wars were unfortunate. He distrusted the whole body of Swedish nobility, whom he suspected of continual plots and revolutions, and placed his whole confidence in men of mean birth, whom he raised to the highest dignities

of the state. His madness first broke out into open violence in the palace of Upsala. He threw into prison Count Svante Sture and his two sons, Nicholas and Eric. The dungeons where they were confined may be still seen below the old palace at Upsala. The family of the Stures was one of the greatest in Sweden, and had repeatedly supplied regents to the kingdom. Indeed before the election of Gustavus Vasa they had the fairest title to the crown. Eric XIV. hearing, while he was at Upsala, that his brother John, whom he had confined for four years at Gripsholm, had made his escape from prison, rushed suddenly into the apartment where Nicholas Sture was confined, and denounced him as a traitor. The young man throwing himself at his feet to appease his fury, the king stabbed him in the arm. Nicholas drew out the dagger, kissed it, and presented it to the king, who, unmoved at this generous behaviour, repeated the blow, and ordered his servants to finish the murder. I saw the coat which Nicholas had on, which is still preserved in the cathedral of Upsala. It is stained with the blood of the young Count, and the two places where he was stabbed by the king may be distinctly seen.

Eric after this rash step flew to the dungeon where Count Svante was confined, and falling at his feet, exclaimed in an accent of despair, "In God's name forgive what I have committed against you." "Willingly," replied the old Count, "but if my son's life is in danger you must answer for it to God." "Yes," cried the king, "I was sure that I should not obtain your pardon." Giving orders to secure the prisoners, he hastily quitted the palace in a peasant's dress, and roved about the country like a madman with a few attendants. Dennis Bury, who had been his tutor, fell at his feet and requested him to spare the lives of his prisoners. This request proved fatal to all parties. He gave a signal to his attendants to murder Bury, and sent immediately to Upsala to order Count Svante and his son to be put to death—orders which were without hesitation obeyed. Soon after this his wife Catherine found him out, soothed him into calmness, and carried him to Stockholm. But his gloomy ferocity soon returned, and his tyranny became intolerable. His brothers John and Charles erected the standard

of rebellion against him. The whole kingdom joined them, Eric was besieged in Stockholm, obliged to surrender, publicly deposed, and thrown into prison. He was confined a prisoner for many years in different parts of Sweden, and was treated with extreme harshness and cruelty. The minds of his former subjects were softened by this harsh treatment, they began to forget his former tyranny, and to incline to revolt in his favour. Eric himself at one time was very near making his escape from prison. These circumstances alarmed his brother John, who easily prevailed upon the senate to condemn him to death. The sentence was executed at Oreby in Upland, in the year 1577. Eric was made without difficulty to swallow a dose of poison in a bason of soup. After his death he was buried in the cathedral of Vesteros, without any other monument than a plain stone, and the initials of his name. The present monument, as has been already observed, was erected by Gustavus III.

Another conspicuous monument in the cathedral of Vesteros is that of Archbishop Troil, who died in 1768.

After leaving Vesteros we went that night as far as Gran, which is four stages from Vesteros. These are as follows:

| | Swedish miles. | English miles. |
|---|---|---|
| Nyquarn | $2\frac{1}{8}$ | 13·7666 |
| Enköping | $1\frac{1}{8}$ | 7·5 |
| Lislena | $1\frac{1}{8}$ | 7·5 |
| Gran | $1\frac{3}{4}$ | 11·666 |
| | $6\frac{1}{8}$ | 40·833 |

At almost every one of these stages small rivers ran into the lake Mälar; but none of them were of sufficient consequence to merit description. Enköping is a town; but it is a poor looking place, greatly inferior in every respect to Vesteros. A little to the west of Gran we passed through an estate belonging to a Mr. Dundas, a Scotch gentleman, who purchased it about ten years ago. It is a beautiful place, and is cultivated with greater taste and skill than any of the other gentlemen's estates that we saw on our journey. It contains a great deal

of fine wood, not merely pines, which are common every where, but oaks and other valuable hard woods.

Posting becomes more and more difficult as you approach the capital. Unless you employ a forebod you are liable to be detained at every stage several hours for horses. At one stage, indeed, quite in the neighbourhood of Stockholm, I was detained about thirteen hours. On Friday morning, September the 4th, we had ordered horses at half past four, but did not get them till half past six. Though our distance from Stockholm did not exceed 33 English miles, yet, being detained at every stage, it was evening before we reached the capital. Our stages were as follows:

| | Swedish miles. | English miles. |
|---|---|---|
| Tibble | 2 | 13¼ |
| Barkarby | 1½ | 10 |
| Stockholm | 1½ | 10 |
| | 5 | 33¼ |

At Tibble, the first stage, we were detained till about half past eleven. At Barkarby we were again detained about two hours. We got into Stockholm about five in the evening, and took up our residence in the English tavern, kept by an English woman, called Mrs. Johnston. The country between Barkarby and Tibble was more hilly than any that we had hitherto travelled. There are frequent pulls up and down pretty steep places. To the eye none of the hills seemed to exceed the height of 100 feet. They were not so abrupt as the hills round Gottenburg, but gently conical and all covered with pines, oaks, and birches. This kind of country continues all the way to Stockholm, and indeed for some way to the south of it. As we approached Stockholm the road became much broader and more beaten; thus announcing the vicinity of the capital. But neither the increased number of travellers, nor a greater apparent population in the country, betrayed any symptoms of the proximity of Stockholm.

As it was during the preceding journey that I had the best opportunity of observing the state of agriculture in Sweden, I shall here throw together the few remarks I made upon the state of farming in

that country. I travelled afterwards, indeed, through more fertile tracts, but the harvest was then so far advanced that my observations were made with less advantage.

It is obvious at first sight that little attention to agriculture has been hitherto paid in Sweden. Nine-tenths of the country at least is in a state of nature, and covered with heath, juniper, and wood. Small patches of cultivated ground appear here and there among the woods. These patches vary in extent; but in general they bear no proportion to the uncultivated tracts. Indeed in Smoland, and in several other provinces, you may travel many miles without meeting with a cultivated field. To account for this carelessness about agriculture is no easy task. The thinness of the population has been assigned as the cause; but it is a very inadequate one. The Swedes do not raise a sufficient quantity of corn to supply themselves, and are obliged to import a considerable quantity annually. The low price of corn, and of all the articles raised by the farmer, has been assigned as another cause. The Finlanders, it seems, raised a much greater quantity of corn than they could consume, and brought it to Stockholm and undersold the Swedish farmers. This account, if correct, proves only that the Finlanders understood farming better than the Swedes. But at any rate it is an evil now remedied by the loss of Finland. The consequence has been, I am told, that the prices have risen in Sweden, and that agriculture has been lately more attended to than formerly. For my part I have no doubt, that the low state of agriculture in Sweden is owing to the total want of the class of men called farmers. The peasants in general have too small farms, and too little capital, ever to make improvements. They satisfy themselves with following blindly the footsteps of their forefathers, without either bringing more land into cultivation, or improving what is already cultivated.

It is true that the soil in many parts of Sweden is not good. In West Gothland, for example, there is very little soil, and what does exist is generally of a bad quality. The same remark applies to Smoland. But in Nerike, in the whole tract between Norköping and the lake Vetter, extending for many miles; in the province of Scone, and

in many other places that might easily be mentioned, the soil is excellent and might be cultivated to great advantage. I have no doubt that a skilful Scotch farmer of capital, were he to take a lease of an extensive Swedish farm, would soon realize a handsome fortune.

The grain chiefly cultivated in Sweden is rye, big, oats, and wheat. The rye is sown in autumn and is ripe by the beginning of next September. As it thrives in a very light soil it is well adapted to most parts of Sweden. The rye crops are generally thin; but they fill the eye and have the appearance of an excellent crop. Perhaps there is no species of grain so well adapted for a northern climate as rye; and perhaps the habits of the Swedes are so fixed that it would be impossible to alter them. But the seeds of rye are so much smaller than those of any other species of grain sown in this country, that, comparatively speaking, it must be a very unproductive crop. As far as my own taste is concerned, I consider barley bread as more agreeable to the palate than rye bread. Though I admit that it is not so well adapted to the Swedish mode of baking only twice a year. For barley bread is only good when newly baked.

The big is sown in the spring, (the month of May) and it is ripe about the same time with the rye. It is a very hardy plant, is fond of a light soil, and thrives remarkably well in Sweden. Every field of it that I saw was good, and at Tibble, a little to the west of Stockholm, I saw the finest crop of it that I ever beheld. It was still green on the 4th of September. But the seeds had reached their full size, and the ears were uncommonly large. Upon one I counted sixty full grown seeds and ten empty ones; upon another no fewer than eighty-four, though some of these also were empty husks. If this field ripened without any accident it must have yielded a most enormous crop.

The oats were greatly inferior, as a crop, both to the rye and the big. But this I was told was owing to the uncommon badness of the summer, 1812, and that in ordinary years the crop of oats is a very fair one. They were generally quite green and would not ripen at all.

Except in Scania, the quantity of wheat sown in Sweden is but

small. I saw several fields of it, however, nearly as far north as latitude 60°. They were in general nearly ripe, and the crop pleased the eye and had the appearance of a good one. The finest field which I saw was at Tibble, near the side of the lake Mälar. It was very much lodged, but so nearly ripe that I dare say it would be got in with safety.

The Swedes have of late begun to sow grass; but the quantity which I saw was very small, comparatively speaking. The grasses which they sow are the *phleum arvense*, or timothy grass, and the *avena elatior*. The first of these is preferred by them. They think it softer and more agreeable to the taste of the cattle than our *lolium perenne*. How far it possesses these advantages I do not know, but the lateness of its flowering is an insuperable objection to its being introduced into Great Britain, as no second crop of hay could be expected from it. Perhaps in Sweden the shortness of the summer may make this an object of less consequence. Yet I should think that our rye grass in common summers would yield two crops even in Sweden. I never saw a field of clover in Sweden, and have reason to believe therefore that it is not cultivated in that country. It is difficult to account for this neglect. Clover requires some skill to manage it properly; but when well made into hay it goes much farther, and sells much higher than grass hay. This is well known in the county of Essex, where the common hay is made of clover, and brings a much higher price than any other hay made in the kingdom.

I saw a few patches of Swedish turnips here and there; but in no great quantity; nor did they look well. The fields were very dirty, and the turnip plants very small, considering the season of the year.

The fields in Sweden are almost all laid out into very broad ridges, with a deep rut cut out between each with a spade, in order to let off the water. These ridges were quite flat, not in the least raised in the middle; yet I saw none of them covered with water, or even marshy. A proof that Sweden is a dry country: the Swedish plough is very small and light, but clumsy; the body is made of iron, like the Scotch plough, but it has no coulter, and instead of terminating behind in

two handles, like our plough, it terminates in one which has a piece of cross wood at its extremity, like the handle of a spade. The ploughman holds it by one hand, while the other is quite at liberty, and he seems to make very little exertion indeed. It is drawn by two horses, two oxen, or sometimes two cows, and one man manages it without any driver. This plough is not intended to go deep; indeed it does little more than just scratch the surface. The ridges are generally tolerably straight, though greatly inferior in this respect to what they are in East Lothian and the south of Scotland.

The fields are all enclosed with wooden palings. This kind of enclosure has some advantage over live hedges, by not collecting together so many birds, and by losing less space. But it is inferior as a shelter to the fields from the winds. Stone walls, which from the abundance of materials might be constructed at a very small expense, would be the best kind of enclosure in Sweden. Indeed most of the corn fields are so thick scattered with stones, that one is surprised how the corn grows at all. There is a prejudice in favour of these stones in Sweden, they are conceived to shelter the corn; and I have seen this prejudice carried so far, that a peasant, who had plenty of waste ground to choose out of, pitched upon the most stony part he could find to sow it with rye. The same prejudices formerly existed in Scotland. But the fields in that country have been cleared of stones, and the crops, instead of failing, as was predicted by some, continue rather to improve.

The fields in Sweden are in general very dirty, and abound with thistles and other weeds of the very worst kind. This is most strikingly the case in West Gothland, where agriculture is at a lower ebb than in any other part of Sweden that I visited. The different kinds of grain are so much mixed together in alternate ridges, that a regular rotation of crops, or any thing like systematic farming, is quite impossible.

When the corn is ripe it is all cut down with the scythe, tied up in very small sheaves, which are set up on end in long rows, and when sufficiently dry they are drawn home, and not put up in stacks out of

doors, as in this country, but all lodged in houses. The common way of thrashing it out is by means of a flail, very unlike that which is used in this country. It consists of two pieces of wood, about the size and length of walking sticks, tied together by means of a leather thong, so loosely, that when one is held in the hand the other may be twirled round the head with great facility. To the end of that stick which is destined to strike the corn there is fixed a thick oblong piece of wood, about four inches long. It is this piece of wood alone which is made to strike the corn and thrash out the grain. The thrashing is as often performed by women and boys as by men. The flail is made to strike the corn with great rapidity, but the blows are light and have but little effect. The Swedes also possess thrashing mills, and they affirm that they possessed them before they were introduced into Britain. How far this claim is well founded I had no means of ascertaining. But I went and saw a thrashing mill which belonged to the Chevalier Edelcranz, near Stockholm, a nobleman possessed of a great deal of mechanical knowledge, and uncommonly accomplished in every respect. This mill was exactly on the same principle as the thrashing mills which are now almost universal in the south of Scotland.

The Swedes are greatly deficient in an indispensable requisite for good farming; I mean the number of cattle which they possess. I was greatly astonished to find the number of black cattle and sheep so small in Sweden. I never any where saw a greater number than 20 cattle together in one place, and never so many at once as 50 sheep. The sheep are uncommonly small, somewhat similar to our Welch breed; but the mutton is good, and the wool not bad. They are uncommonly tame, considering the thinness of the country in point of population, and the state of comparative wildness in which they appear to live. This tameness must be owing to the severity of the Swedish winters, when they must depend entirely for their food upon the provident hand of man. The smallness of the number of cattle must deprive the farmers of the requisite quantity of manure, without which farming to advantage is quite out of the question.

That our readers may have an accurate conception of the number of

cattle in Sweden, I shall give here the general result of a survey made to determine the point in 1811.

| | Horses. | Oxen. | Cows. | Young cattle. | Sheep. |
|---|---|---|---|---|---|
| Norrland | 32750 | 13221 | 106561 | 23528 | 141550 |
| Svealand | 118669 | 59845 | 285947 | 118509 | 389509 |
| Gotaland | 252328 | 161156 | 422208 | 284525 | 682693 |
| *Totals* | 403747 | 234222 | 814816 | 426710 | 1212752 |
| | | | 1,475,748 | | |

Such are the numbers of horses, black cattle, and sheep, for a country exceeding Great Britain in extent of surface. Nothing more is requisite to demonstrate the low state in which agriculture must be,

PLAN *of the* CITY *and* SUBURBS *of* STOCKHOLM.

Engraved by J. Shury Gt. 17 Thompson Travels in Sweden; Published May 1 1811.

# CHAPTER V.

## ACCOUNT OF STOCKHOLM.

Situation of Stockholm—Description of the City—Statue of Gustavus Adolphus—Opera-house—Theatre—Northern Suburb—Maps of Stockholm—View from the Observatory—Number of Inhabitants—Trades—The Palace—Statue of Gustavus III.—Obelisk—Statue of Gustavus Vasa—Mint—Exchange—Churches—Religion—The Arsenal—Academy of Sciences—Collection of Minerals belonging to the College of Mines—Collection of Mr. Svedenstierna—Swedish Academy—Scottish and English Dialects compared—Account of the Swedish Language—Houses in Stockholm—Account of the Societé and the Selskap.

THE observatory of Stockholm is placed by the Swedish astronomers, in consequence of a series of observations continued for about seventy years, in north latitude 59° 20′ 31″, and east longitude from Ferro 35° 36′ 15″, which is equivalent to about 18° 5′ 15″ east longitude from Greenwich, according to the observations of Wargentin.* This city is most singularly situated at the confluence of the lake Mälar, with an inlet of the Baltic. Stockholm consisted originally of the buildings erected upon a small island. This island still constitutes what is called the city of Stockholm. It was gradually united with the neighbouring continent by bridges, and at present by far the greatest part of the town is situated on the north and on the south side of the lake. These are called the north and south suburbs (*norra* and *söder malm*). Besides these suburbs, the town is said to stand upon seven islands; but

* Phil. Trans. 1777. Vol. lxvii. p. 162.

there are only three of these which, properly speaking, constitute a part of the town. The others contain either buildings connected with the Admiralty, or fortifications to defend the inlet of the sea.

The town is generally believed to have been founded in the 13th century by Birger Jarl, at that time Regent of the kingdom. It has not been the royal residence for a much greater length of time than a century. Before that period the Kings of Sweden resided at Upsala. As to the etymology of the word Stockholm, and the fabulous particulars respecting King Agne, the son of Dag, who lived about the year 250 of the Christian era, I refer those readers who are curious about such things to the first volume of Eler's Account of Stockholm, where they will be amply gratified.

The most magnificent part of the city, and the place where the greater number of public buildings are placed, is the central island which constituted the original city of Stockholm. Here are situated the palace, the house of the nobles, the mint, the exchange, the bank, the post-office, the police-office, and several other public buildings of considerable consequence. Here also is the quay, and the harbour where the shipping lies. This island is not far removed from the continent upon the north side. A small island intervenes; on both sides of which the lake Mälar discharges itself into the neighbouring inlet of the Baltic with considerable impetuosity. The island is joined to the continent by a very spacious and magnificent bridge; from about the centre of which the finest part of the city may be seen. When you stand upon this bridge and look south, the King's palace immediately strikes the eye, a building of immense extent, and seen with peculiar advantage from the bridge. Towards the east, the inlet of the Baltic stretches itself before the eye covered with ships, and thick scattered with barges plying from place to place under the direction of women; for the boats at Stockholm are all rowed by women. Your eye in this direction is stopped by the showy buildings on the Admiralty Isle, and by the castle.

On the north end of the bridge there is a small square, in the centre of which stands a statue of Gustavus Adolphus on horseback, in bronze.

The project of erecting this statue was started in 1757, but in consequence of many unforeseen difficulties, and the enormous expense, it was not set up before the year 1791. This statue is considered as a striking likeness of Gustavus Adolphus, and is admired by connoisseurs as an excellent piece of workmanship. Some faults indeed have been pointed out; but I cannot say that I was struck with them even when they were mentioned.

Upon the east side of this square is the opera-house, originally erected by Gustavus III. and destined for the exhibition of Italian operas. But for some time past all those performed in it are in the Swedish language. This house occupies the whole side of the square, and though not very splendid on the outside, is very elegant within. It was here that Gustavus III. was shot by Ankerström in 1792, during the time of an opera. Immediately after the shot was discharged, a cry of fire was raised by the conspirators, to give them an opportunity of making their escape during the confusion: but the project did not succeed. They were all seized; though the only one put to death was Ankerström, the actual assassin. For some time after this catastrophe the opera-house was shut up; but it has been again open for several years.

Immediately on the east side of the opera-house stands the Swedish theatre, in which small Swedish plays, frequently translations from the French, are acted. The house is very small, but neat. During the continuance of an act, the only light in the house is the row of lamps destined to illuminate the stage; but at the end of the act a lustre is let down from the roof, and withdrawn again as soon as the acting commences. This in so small a house has a good effect. The theatre is seated somewhat differently from ours. The pit is divided into two compartments, the one of which farthest back is called the amphitheatre. It is considered as one of the best situations in the house. It contains three rows of seats, which are all numbered behind. These numbers are put upon the tickets, and whatever number happens to be upon your ticket, you must find out the same number in the amphitheatre, and take your station accordingly.

On the west side of the square is the palace of the Princess Sophia

Albertina, sister to Gustavus III. This is a magnificent building of considerable extent. Like the opera-house, it occupies one side of the square.

The northern suburb, or *norra malm*, as it is called, constitutes the largest division of the city. The streets of which it consists are not very regular, and are in general narrow. The principal of them is called *Drothning Gatan*, or Queen-street. It runs all the way from the north gate to the lake side, which is about $1\frac{3}{4}$ English mile; but the whole of this distance is not filled with houses. The street properly so called begins only at the observatory, and runs in a straight line very nearly an English mile, constituting the longest, and perhaps upon the whole the finest street in Stockholm. By casting the eye over the annexed map of Stockholm, the reader will be able to form a more accurate idea of the north suburb than he could acquire by the most elaborate description. The southern suburb is not so extensive as the northern, nor does it contain so many fine buildings. But the map of Stockholm will here save a great deal of tedious description.

No less than sixteen different maps of Stockholm have been published at different times, the first as far back as the year 1547. Most of these may be still seen in Stockholm, and they are curious, because they show us the gradual improvements which have taken place in the buildings and in the streets. The map which is annexed to this chapter is reduced from the large sheet map published by Fr. Akrel in 1795, and brought down by him to the year 1811. It is deservedly considered as the most accurate map of the town which has ever appeared; though the style of engraving is somewhat blameable, as not sufficiently distinguishing between what is town and what fields. His object seems to have been to swell the town as much as possible, and conceal its real dimensions from the eye: these faults have been in a great measure corrected in our copy.

Our first object, after reaching Stockholm, was to take a survey of the town, and examine its most remarkable buildings, squares, and curiosities. I reserved my visits to the different collections, my introduction to men of science, and my inquiries respecting the different

scientific institutions, till after my return from Dalecarlia. But I think it better to introduce here all the remarks that I made, and all the information that I could collect, than to divide the subject into two parts, merely because a journey intervened during the course of my observations.

My whole stay in Stockholm amounted to about three weeks, so that I had full leisure to satisfy myself about every thing remarkable which was to be found in it. In consequence of the great inequality of the ground, and the abundance of water on all sides, it is not easy to form an adequate notion of the size of Stockholm. The best point of view is the little hill on which the observatory stands: it commands the whole city. You take in at once all the remarkable buildings, the squares, spires, streets, lake, and shipping. Nothing can be more romantic than the view of Stockholm from this place. The houses are almost all of stone, or brick covered with plaster. The churches are mostly crowned with magnificent spires. The inlet of the Baltic covered with ships; the lake Mälar scattered with little hills constituting islands, some of which were covered with buildings or forts, while others are bare cliffs of gneiss, or thick set with birches and pines; the environs in every direction entirely in a state of nature; no marks of culture, and scarcely a gentleman's seat any where to be seen; but the remarkable inequality of the ground, the great proportion of water, the abundance of wood, and the fine contrast between the dark green of the pines, the lively green of the oaks, the autumnal yellow of the birches, and the red of the poplar, formed a whole exceedingly pleasing and beautiful. Hardly a rock I should suppose exceeds 100 feet in height; yet the inequality, small as it is, adds prodigiously to the beauty. Much of the beauty is owing to the lake, and not a little to the striking contrast between the magnificence of the city and the wildness of the environs.

Stockholm does not cover nearly so much ground as Edinburgh, at least if we include Leith. Nor would it be fair to compare the beauty of these two cities: the one owing a vast deal to the high state of cultivation every where surrounding it; the other depending chiefly upon

the native wildness of its position. Stockholm affords no mountain view whatever as Edinburgh; and this at least in my estimation, who have been accustomed for the greatest part of my life to mountain prospects, is a defect. When in a level country I cannot help thinking that the distant horizon is bounded by the sea, and my constant want of success in catching a glimpse of the water which I conceive to be before me, gives a kind of uneasy feeling of disappointment.

The number of inhabitants at present in Stockholm amounts to 72,652; so that it is somewhat less populous than the city of Bristol, which contains rather more than 76,000 inhabitants. In the year 1751, the number of inhabitants of Stockholm was 55,700; and in the year 1772 they amounted to 72,444, so that since that period it has remained in some measure stationary. Notwithstanding this increase of population, the number of masters exercising the different trades and professions have rather diminished than increased. This, which appears from the following curious table, indicates some radical defect in the constitution and laws of the Swedish towns. For, as far as I could learn, this diminution was not confined to Stockholm, but was equally observable in all the towns of Sweden. It indicates obviously that the corporations have too much influence, a power when it exists which proves injurious to every place. We have a striking example in Great Britain. The town of Berwick-upon-Tweed is remarkably well situated for trade. It is in the centre of a rich corn country, thinly inhabited, and obliged therefore to export a great deal of corn. But the inhabitants of Berwick have hit upon a very simple method of preventing their town from becoming a trading town. They have passed a law that none but a citizen of Berwick can become a merchant in the place. As the town has an extensive landed property, it is the apparent interest of the citizens to prevent their number from increasing. Thus every spirited merchant is in fact prohibited from settling in the place.

| Number (in Stockholm) of | 1730 | 1758 | 1797 |
|---|---|---|---|
| Bakers | 60 | 48 | 32 |
| Brewers | 124 | 105 | 50 |

| Number (in Stockholm) of | 1730 | 1758 | 1797 |
|---|---|---|---|
| Tin plate-workers | 6 | 9 | 6 |
| Bookbinders | 22 | 13 | 26 |
| Builders | 9 | 12 | 10 |
| Brush-makers | — | 4 | 4 |
| Bath-keepers | 6 | 5 | 6 |
| Paper-makers | 15 | 11 | 8 |
| Coffee-roasters | — | 17 | 19 |
| Fishmongers | 38 | 38 | 30 |
| Tanners | 14 | 18 | 17 |
| Goldsmiths and jewellers | 58 | 54 | 70 |
| Gold-wire-drawers | 7 | 4 | 2 |
| Glass-workers | 15 | 19 | 12 |
| Belt-makers | 6 | 12 | 7 |
| Coppersmiths | 3 | 11 | 9 |
| Gold-beaters | 2 | 3 | 2 |
| Hat-trimmers | — | 8 | 8 |
| Glovers | 20 | 14 | 10 |
| Horse-shoers | 36 | 34 | 32 |
| Carriage-hirers | — | 19 | 18 |
| Furriers | 16 | 15 | 17 |
| Button-makers | — | 13 | 11 |
| Locksmiths and gunsmiths | 21 | 35 | 26 |
| Bell-makers | 5 | 5 | 3 |
| Dealers in stone ware | — | 14 | 12 |
| Comb-makers | 5 | 6 | 7 |
| Cutlers | — | 2 | 1 |
| Linen-weavers (Len vafvare) | 18 | 19 | 16 |
| Painters | 12 | 21 | 30 |
| Braziers (Mässingslagare) | 3 | 5 | 4 |
| Masons | 6 | 13 | 11 |
| Millers | 44 | 39 | 20 |
| Net fishers | 6 | 4 | 5 |
| Pin and needle-makers | 6 | 10 | 5 |
| Wig-makers | 44 | 48 | 36 |

| Number (in Stockholm) of | 1730 | 1758 | 1797 |
|---|---|---|---|
| Tool-makers (Plätslagare) | — | 7 | 9 |
| Pump-makers | 6 | 3 | — |
| Parchment-makers | — | 2 | 1 |
| Rope-makers | 12 | 18 | 8 |
| Confectioners | 10 | 13 | 17 |
| Tailors | 158 | 113 | 138 |
| Shoe-makers | 154 | 131 | 170 |
| Gold and silver lace-makers | 18 | 16 | 14 |
| Furbishers (Svärdfejare) | 10 | 11 | 5 |
| Joiners | 42 | 56 | 61 |
| Saddlers | 26 | 26 | 27 |
| Stone-cutters | 3 | 7 | 4 |
| Sail-makers | 5 | 8 | 9 |
| Butchers | 44 | 44 | 35 |
| Chair-makers | 7 | 11 | 14 |
| Spar-makers | 3 | 3 | 2 |
| Turners and Block-makers | 9 | 15 | 9 |
| Boatmen | — | 20 | 13 |
| Tool-grinders | 5 | 3 | 1 |
| Paviors | 52 | 81 | 44 |
| Chimney-sweeps | 8 | 5 | 0 |
| Keepers of ordinaries | — | 17 | 113 |
| Pewterers | 10 | 13 | 9 |
| Coopers | 21 | 27 | 19 |
| Gardeners | — | 75 | 33 |
| Vintners | — | 44 | 47 |
| Cart-makers | 15 | 15 | 18 |

There is no doubt that a royal mansion or palace was erected in Stockholm by Birger Jarl, and that several of the succeeding kings, such as Eric XIV. occasionally resided there. But there are no remains of these old palaces, which appear to have been situated in the Ritterholm, a small island contiguous to that which constitutes the city of Stockholm, and joined to it by a bridge. The present palace stands upon the highest spot of ground in the island of Stockholm. It was

begun by Charles XI. and finished by his successors. It is a large quadrangular building, with a square or court in the inside, and is the most magnificent royal palace which I have seen; unless the palace at Versailles be considered as an exception. But though the French palace is abundantly magnificent, it is not equal in elegance to the Swedish; the fantastical ornaments, and above all, the garden, injuring prodigiously the effect of the whole. As to the palace of the Thuilleries it is but a poor building in a very bad taste. As to the palaces of the kings of Great Britain, there is not one of them that deserves to be mentioned. Perhaps the finest of them is the palace of Holyrood-house at Edinburgh; but in point of size it will bear no comparison with the palace of Stockholm. This is conspicuous from every part of the city, in consequence of its situation and height. It is flat roofed, and destitute of a spire; being built in the Grecian taste. I am told it is built of brick; but it was impossible to determine this by inspection, as it is covered with plaster. The parts within the reach of the hand were of polished granite, which had a fine effect. This palace is not wholly occupied by the king, several other persons having apartments in it; as for example, the king's physician, Dr. Weigel, whom I visited there.

A little to the east of the palace, upon the quay, stands a statue of Gustavus III. in bronze, which struck me as the finest in Stockholm. It is said to be an excellent likeness of that prince. He is standing upon a pedestal of polished porphyry, bare headed, and in the attitude of haranguing his troops. The statue is 11 feet high. The king is dressed in a long mantle. His right hand is lifted up and holds a branch of olive. Below the statue is the following inscription:

AT
K. GUSTAF III.
LAGSTIFTARE.
SEGERVINNARE.
FREDENS. OTERSTELLARE.
AF
STOCKHOLMS BORGERSCAP.
1790.

This inscription literally translated into English is as follows:

To
King Gustavus III.
Legislator,
Conqueror,
Restorer of Peace;
by
The Citizens of Stockholm.
1790.

The modeling of this statue cost 10,000 rix dollars, the casting and metal 20,000.

A little higher up, or upon the top of the hill, and in the open space east of the palace, there is a beautiful obelisk of polished porphyry, erected by the late king to the memory of his father, Gustavus III.

The next house, in point of magnificence and importance to the palace, is the house of the nobility, where they hold their sittings during the meeting of the Diet. It stands on the side of a small square at the extremity of *Stora Ny Gatan,* just by the bridge which joins the island Ritterholm to Stockholm.

Before it stands a statue of Gustavus Vasa. It was erected by the Order of Nobility in the year 1760, and has nothing about it very striking. At the top of the pedestal is this inscription: *Gustavo. Erici. Patriæ. Libertatis. Religionis. Vindici.*; and below, *Ex. Nobili. Cive. Opt. Regi. Post. Bina. Secula. Posuit. Ordo. Equestris.*

The Mint is a large building, standing at the corner of a street not far from the palace. It was repaired in 1790, so that its present front may be considered as almost new. Though magnificent enough it has somewhat of an awkward appearance. The front is very short, and the whole of it is occupied by four fluted stone columns without any base. Here is the chemical laboratory, and here also is the collection of minerals belonging to the College of Mines. This collection is under the care of Mr. Hjelm, a man of 75, and well known as the chemist to whom we are indebted for the first reduction of molybdenum to the metallic state, and the first exact account of its properties. The whole of his long life has been devoted to mineralogy, and he has been of considerable

service to Sweden, by pointing out the nature of her minerals, and answering the questions of those country gentlemen who conceived they had found valuable minerals upon their property.

Stockholm was long without an Exchange. An attempt was made to build one in 1667, but it failed; the present was begun in 1757, and the expense was defrayed by a tax upon all the vessels that came into the harbour of Stockholm. This tax continued till the year 1787. It is situated in the great market place, a little to the south of the palace. It consists of a room about 80 feet long, and about half as wide, with a recess in the middle, opposite to the door. You enter it by a flight of stone steps on the outside. The room is a good one, but too small for the purpose. At the hour of full 'change, which is between one and two o'clock, it is so crowded that it is with the utmost difficulty you can squeeze through the mass, and walking through the room at that time is out of the question. The Exchange at Gottenburg is still smaller, and still more crowded. It feels exactly like an oven, and to one not accustomed to such situations is extremely unpleasant.

I visited most of the churches in Stockholm; but I do not consider it as worth while to give a particular description of them. My object was not to look at buildings, and I confess I consider it as a pity to fill my pages with such matters, when I have abundance of other things which I conceive to be more important to communicate. Most of the churches are rather elegant. Above the altar was always a large picture, and most commonly there were two others, one on each side of it. The subject of these pieces of course is scriptural. There were sepulchral monuments in all the churches; but none of them struck me as particularly handsome, or deserving description. The pews are all locked, and the Swedes never ask you into any of them; so that if you go into a church you must stand in the passage all the time. Indeed there are seats in the passage for the accommodation of those who have no pews, and they are by far the most crowded part of the church, as a great proportion of the pews, from their being locked, are empty.

The Swedish church is the Lutheran, and the service, as far as I

could judge, bears a considerable resemblance to that of the church of England. The Swedes have a common prayer book. The service begins with psalms, which, as far as I could judge by the ear, were in prose. The organ plays, and all the congregation join in the singing. The priest then read prayers at the altar. The singing was repeated, and prayers were again read. This continued for a considerable time, and to me who did not understand the language it was not a little fatiguing. Last of all a clergyman went up into the pulpit and read a sermon with great rapidity, holding up the leaves of the manuscript in his hand. As soon as he had finished a leaf he gave it to a man who stood behind him ready to receive it. As soon as the sermon was finished the clergyman went out; psalms began, and the service concluded.

The attention paid to Sunday in Sweden is much less than is paid to it in Great Britain; and to me, who had been educated in Scotland, where the sabbath is observed with peculiar strictness, the difference appeared so great that I could not help remarking it. The only thing, as far as I could observe, which distinguished Sunday from the other days of the week was that the shops were shut and the churches open. The tradesmen work at all their different professions on Sunday as on any other day. Thus I saw blacksmiths, shoe-makers, tailors, &c. at work in their shops upon Sunday as usual. The theatres are likewise open upon Sunday evening. But this is not surprising, as the Swedish Sunday ends at six in the evening, beginning at six the preceding evening. This is the way they reckon their time: the day with them always begins at six in the evening, and terminates at six in the evening. Thus in travelling, for example, on the first of October I found the date in the day-books after six o'clock always marked second of October.

In the city of Stockholm, strictly so called, there are only two Swedish churches; namely, the *Great Church*, hard by the palace, and the *Svartbrödra Kloster*, formerly a cloister. There is likewise a German church, a Finnish church, two French protestant churches, and a Jewish synagogue. There is a church also in the Ritterholm which

has a magnificent outside, but it was shut up when I was at Stockholm, so that I had no opportunity of seeing it. In the *Norra Malm*, or north suburb, there are six churches, namely, St. Clara's cloyster, St. Clara's church, Adolphus Frederick's church, St. Jacob's church, St. John's chapel, St. George's chapel. In the *Söder Malm*, or south suburb, there are five churches; namely, Mary Magdalen's church, Catharine's church, Holy Cross chapel, a Russian church, and a Roman Catholic church; so that the whole Swedish national churches in Stockholm amount to eleven. There are five churches belonging to foreigners, a Roman Catholic chapel and a Jewish synagogue. From this statement it would appear that the number of dissenters in Sweden is exceedingly small. I do not recollect to have observed any dissenting churches in any of the numerous towns through which I passed: it can hardly be said that any exist in Stockholm. This is very different from what is to be seen in Britain and Holland. In England, I am persuaded, the dissenters amount to about one half of the population, and in Scotland, perhaps, to a fourth or fifth part of the whole. The natural tendency to dissent is greater in episcopalian than in presbyterian countries, because the morals of the great body of the clergy must be expected to be more lax in the first case than the second, in consequence of the great difference of discipline and situation. Hence I conceive, that in Sweden some peculiar circumstances must exist to prevent dissenting, probably some prohibitory laws.

One of the most curious places in Stockholm is the arsenal. It is situated in the north suburb in what is called the King's Garden, a small spot laid out in pleasant walks and planted with trees, constituting an agreeable walk which is open to all the inhabitants of Stockholm. The arsenal contains a vast number of standards and trophies taken from the Danes, the Poles, and the Russians, most of them by Charles XII. There is also to be seen the skin of the horse upon which Gustavus Adolphus rode at the battle of Lutzen. There is a boat built by Peter the Great, at Sardam, in Holland, which was taken by a Swedish vessel while on its way to Petersburgh; but

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perhaps the greatest curiosity is the clothes and hat worn by Charles XII. when he was shot in the trenches before Frederickshall. The coat is a plain blue uniform, with large brass buttons, like that of a common soldier; the gloves are of buff and reached almost up to the elbow; the right hand glove is a good deal stained with blood, and so is a buff belt which he wore round his body; the hat seems to have been slightly grazed by the ball in that part which immediately covered his temple. It is still a current opinion in Sweden, that the king was assassinated by some of his own people. This was maintained to me by several very intelligent Swedish gentlemen; but on questioning them closely, I found that their opinion rested upon no positive evidence. One gentleman said it was the character of the Swedes not to submit to those kings who had made themselves absolute. He gave as examples Charles XII. Gustavus III. and Gustavus Adolphus IV.; but this is an argument not entitled to much attention. The subject of the death of Charles XII. has been handled so minutely by Mr. Coxe in his travels, that I cannot do better than refer those readers who are interested in it to that entertaining writer for satisfaction.

The house belonging to the Academy of Sciences, and in which they hold their meetings and keep their library and collections of natural curiosities, is situated in *Stora Ny Gatan*, and deserves to be visited by every scientific foreigner who goes to Stockholm. This Academy was founded on the 2d of July 1739, by six private individuals, whose names deserve to be mentioned: they were Jonas Alström, Baron And. Joh. Von Höpken, Sten Bielke, Charles Linnæus, Marten Trievald, and Baron Charles William Cederhjelm. Linnæus was the first President, and Baron Von Höpken the first Secretary. The President is changed every six months, and he always concludes his duties with a speech, which is published; these speeches are often very interesting; they now constitute a considerable number of volumes. The Secretary being permanent, is in fact the person upon whom the burden of the society falls; on that account he has a salary. I shall here give a list of the different Secretaries since the foundation of the Academy:

Baron Von Höpken till. . . . . 1741
Overdirector Faggot. . . . . 1744
Pehr Elvius. . . . . 1749
Pehr Wargentin. . . . . 1783
John C. Wilcke
with
Hindr. Nicander.
Melanderhielm
with
I. Svanberg.

The present Secretary is Olaus Swartz, a celebrated botanist, famous over all Europe for his Account of West India Plants, for his Treatises on Ferns, &c. To this I may add, that he is a man of the most agreeable manners and the most obliging politeness. To him I am indebted for the visits which I was enabled to make to the house of the Swedish Academy.

The Swedish Academy, like the Royal Society of London, is quite free, receiving no other mark of favour from the crown than protection. They have a considerable income, derived chiefly from presents and legacies left them by the lovers of science in Sweden; their number is unlimited. At present it amounts to about 100 Swedish, and 60 foreign members; they publish their Transactions quarterly in the octavo form, and the four annual numbers make a thin volume; they embrace all the different branches of natural philosophy and natural history; and their Transactions, written in the Swedish language, constitute a splendid monument of their genius and industry. Natural history occupies a considerable part of those volumes, which I have particularly examined. They have kept a very accurate journal of the weather at Stockholm ever since their institution in 1739, and some curious meteorological papers have appeared in their Transactions. The Royal Observatory at Stockholm is under their direction, and the astronomical observations of Wargentin, and the skill with which a degree of the meridian was measured by them within the polar circle in 1802, testify the progress they have made in mathematics

and astronomy. The last Secretary of the Academy was a mathematician; the present is a botanist. This may perhaps occasion a difference in the complexion of the Transactions, and thus upon the whole add to the variety and consequent interest of their labours.

There is a considerable library belonging to the Academy, a very great portion of which consists of foreign books, chiefly in the German and French languages; though there are likewise a considerable number of English books.

Of their collection of natural history the most complete part is the class of amphibious animals; in quadrupeds they are rather poor. The species of birds which they possess amount to about 400, among which are almost all the birds found in Sweden. Their collection of shells is beautiful, but not very numerous. The collection of quadrupeds, birds, and shells at Upsala is much more extensive. Besides these specimens of animals there are many curiosities from the islands in the South Seas and other parts of the world, presented to them by Sparrman and other travellers. But of these it would be needless to give any account to the English reader, as much more complete collections of similar curiosities may be seen in the British Museum, and some other places in Great Britain. One of the greatest curiosities, to me, was a piece of the bread which in some parts of Norway and the north of Sweden is made of the bark of trees; it was a thin cake, of a brownish colour, and certainly had not a very inviting appearance. The Academy possesses a collection of dried specimens of plants; but they have no minerals. In the meeting room are hung portraits of all the eminent members of the Academy deceased. Among others there is a portrait of Bergman, which Mr. Swartz, who knew him, assured me was a very good likeness. I looked in vain for a portrait of Scheele; all my inquiries after such a portrait in Sweden were unsuccessful, and Mr. Gahn, at Fahlun, who had been his intimate friend, assured me that no portrait of him existed. When I was at Stockholm the President of the Academy was Archiater Afzelius, professor of medicine at Upsala, and physician to the Crown Prince, a nephew of the celebrated Bergman.

I spent several days in looking over the collection of minerals belonging to the College of Mines. It is very extensive, consisting of specimens from all the provinces of Sweden, arranged according to their localities. Such a collection, from the very nature of it, must abound in repetitions; but it is valuable by conveying a general idea of the mineral productions of every part of the country. The specimens are not always well chosen, and they are rather dirty, which makes it more difficult to determine their nature. Iron ores are by far the most numerous: copper ores come next. Lead is uncommon, and the other metallic ores in such small quantities that they scarcely deserve to be noticed. The rocks are mostly primitive or floetz trap. I saw not a single specimen of a transition rock in the collection, and but few of floetz rocks. The most showy mineral in the collection was the garnet, some of which are of a great size, and very regularly crystallized. The finest specimens came from Fahlun, where they are now scarce. I saw specimens of spinell in lime-stone discovered by Mr. Svedenstierna. The lime was used to facilitate the fusion of iron ore, and the workmen complained that it did not answer the purpose, and that the more lime they added the more infusible the iron ore became. The discovery of the spinell, which was scattered in profusion through the lime-stone explained this anomaly. The same skilful mineralogist discovered zircon in the iron ore of Gellivare. In some of the specimens of that ore, in the cabinet of the College of Mines, the crystals of zircon were very distinct.

The cabinet of the College of Mines contains likewise a good many foreign specimens, chiefly from Britain and France. Many of them were beautiful and valuable; but to me, whose object it was to see as many Swedish minerals as possible, they were not so interesting as they would naturally be to a Swede. One of the greatest curiosities in the cabinet of the College of Mines was a large specimen, which Mr. Hjelm informed me came originally from China. It consists of a large piece of a tree: in the centre it is perfect wood: as we approach the circumference, it becomes more and more petrified, and there is a zone at the outside more than two inches thick, of perfect woodstone.

This specimen has been long in Stockholm. Mr. Hjelm knew nothing of its history except that it came from China.

I ought also to mention the mineralogical collection belonging to Mr. Svedenstierna. It consists in fact of two distinct cabinets. One a systematic collection arranged according to the method of Haüy: the specimens of necessity are mostly foreign. They are small, but well chosen, and in very good order. The second collection consists chiefly of Swedish minerals: the specimens are large, and many of them remarkably beautiful. Mr. Svedenstierna is particulary rich in iron ores. The Swedish iron ores deserve much more attention from mineralogists than has hitherto been bestowed on them. It would be a very difficult matter to reduce them under the species of any mineral system whatever. Indeed I consider the arrangement of iron ores as by far the most imperfect part of mineralogy. Nor will the confusion ever be remedied till some chemist undertakes the arduous task of subjecting them all to a regular analysis.

Besides the Academy of Sciences, there is another academy at Stockholm, instituted by Gustavus III., and distinguished by the name of the Swedish Academy. It consists of eighteen members; and the object of it was to polish and fix the Swedish language, as the French language was by the French Academy. I do not know that the members of this Academy have hitherto done any thing towards accomplishing the object of their Institution. But there can be no doubt that the field before them is an ample one, and well worth their exertions. The Swedish language has proceeded from the original Scandinavian, which has now branched itself out into three languages, the English, the German, and the Swedish. For I consider the Danish as only a dialect of the Swedish. Of these three languages the Swedish appears to me to be by far the smoothest. Many of their words terminate in vowels, and we never find those harsh combinations of consonants which still strike the ear in the German language, and the eye in the English. For though we have banished them from our pronunciation, they continue to hold their places in our written language. It is very difficult to account for this superior smoothness of the Swedish over the Ger-

man. Had the Swedes been a musical people, I should have been disposed to have ascribed it to that circumstance; but after a good deal of pains spent in the pursuit, I could not ascertain that they have any music of their own whatever. No collections of Swedish music were to be had in Stockholm or Gottenburg. The music universally played was Italian. Whenever I happened to be at a musical party, I never failed to request a Swedish song, or a Swedish piece of music; and though my request was often complied with, yet I cannot say that the result was satisfactory. Some of the tunes were pretty enough: but they all bore evident marks of being quite modern, and the resemblance which they bore to Italian music, or to the French *petits chançons*, was too striking to be overlooked.

The circumstances which occasion a difference in point of smoothness between two dialects of the same language cannot always be traced to any adequate causes. An Englishman would smile with incredulity or contempt if I were to affirm, that the Scottish dialect and the Scottish pronunciation are much smoother than the English. Yet any person that will be at the pains to examine may soon satisfy himself that this is the matter of fact. With respect to the smoothness of the words, a few examples may be given, and I shall take those that first occur:

| English. | Scotch. |
|---|---|
| Twilight . . . . . | Glowming. |
| Halfpenny . . . . . | Bawbie. |
| To her . . . . . | Till'er. |
| Cool . . . . . | Cawler. |

In the Scottish dialect pains are taken to prevent the hiatus of two vowels. This is exemplified in the last example but one, *to*, before a word beginning with a vowel, is always changed into *till*. In a vast number of words the difference between the English and Scottish words is merely that the Scotch leave out the concluding consonants, and make the word terminate in a vowel. Thus,

| English. | Scottish. |
|---|---|
| Ball | Baw. |
| Call | Caw. |
| Fall | Faw. |
| Hall | Haw. |
| Small | Smaw. |

Thousands of other examples might be given if this were the proper place.

As to pronunciation, I do not conceive that either the Scotch or the English are adequate judges upon which side the superiority in point of smoothness lies. There is one circumstance which must always turn the apparent scale in favour of the English pronunciation, even in the opinion of the Scotch themselves. The English is now the classical language of the empire: England is the residence of the court, and of consequence the standard of accurate and fashionable pronunciation. Whoever wants the true English pronunciation is so far looked down upon on that account as a provincialist or foreigner. Now we all know the effect of fashion in regulating our opinions of elegance and beauty. When we meet a person dressed exactly according to the fashion, we immediately attach a certain elegance to the dress, however ridiculous or awkward or absurd it is in reality. When we see a person dressed quite out of the fashion, though his dress in reality should be the perfection of elegance, we cannot help setting it down as vulgar and awkward. Now this feeling has the same effect upon pronunciation as upon dress. Ask any Englishman, or any Scotchman, whether the English or Scottish pronunciation is most pleasing to the ear, and he will answer without hesitation, the English. Were the question put to myself, I am not sure but I should return the same answer. It is not from my own ear therefore that I draw my conclusion; but from a comparison of the accent of those nations, whose languages are universally allowed to be the smoothest, with that of the English and Scotch. Now I appeal to any person who has heard it, whether the accent of the Italians does not approach much nearer to that of the Scotch than to that of the English. When I was in Sweden, and heard

the people speak at a little distance without attending to the words, I conceived myself in Scotland; the accents were so nearly the same. It has often struck me as a circumstance very difficult to be accounted for, how the English have varied so prodigiously in the pronunciation of their vowels from all the other nations in Europe, with whom they were most intimately connected, or who spoke originally the same language. The German and the French are both intimately connected with the English language, yet nothing can be more different than the mode of pronouncing the vowels in English, and in German and French.

The words of the Swedish language bear so close a resemblance to the German, that a person well acquainted with the latter language may, without much trouble, make himself acquainted with the former. The idiom is almost exactly English, so that you may turn most Swedish sentences word for word into English, and they will make sense. There are a good many Swedish words which resemble the English very closely, either in their spelling or pronunciation. So that to a native of Britain the Swedish language is not attended with much difficulty.

The Swedes have all the letters of our alphabet, and three more, with which they conclude their alphabet; these are å, ä, ö pronounced *o, ai,* and the last like the French *u*. These letters no doubt were originally the dipthongs *ao, ae, oe*. One of the most striking irregularities in the Swedish alphabet is the use that they make of the letter *k*. It is used precisely as *c* is with us; that is to say, before the hard vowels it sounds like our *k*, but before the soft vowels it has the sound of our *ch* in *church*. This is one of the irregularities which it would be worth the while of the Swedish Academy to attend to. As the letter *k* is not used in this way in any other European language, it would perhaps be worth their while to substitute for it the letter *c*, which would bring the Swedish mode of spelling to a much greater uniformity with that of other nations; while their pronunciation would have a certain resemblance to the Italian in the use of the letter *c*.

The use of the *article* in the Swedish language, as far as I know, is

quite peculiar to it, and exhibits a singular economy in words. There are two articles in Swedish as well as in English, but the same word according to its position answers for both; *en* or *ett* placed before a word constitutes the indefinite article *a*; placed after a word, it constitutes the definite article *the*. Thus *en del* signifies *a part*; *delen, the part*; *ett barn, a child*; *barnet, the child*. In the plural the definite article is often *ne* added to the word. Thus *dal, a valley, dalar, valleys, dalarne,* the *valleys*. The plural of substantive nouns is made, by adding the syllables *or, ar, er, n* to the singular. Their degrees of comparison are nearly the same as our own. Another singularity in the Swedish language is the mode of forming the passive voice of their verbs. It is done by adding the letter *s* to every tense and person of the active voice. So that except this additional letter there is no difference between the active and passive voice.

Upon the whole, the Swedish language seems highly deserving of cultivation and preservation, though from the small population of the country, and the little encouragement which authors experience in Sweden, the language can never expect to rival the English, German, and French, which may be considered as the three general languages in Europe: still it is probable that the merit of the Swedish writers, and the merit of the language itself, will gradually give it a much greater currency through Europe than it has hitherto attained.

The houses in Stockholm are usually three stories high, and large in proportion. It is the custom, as it is in Paris and Edinburgh, for a single floor to be inhabited by a family; so that a number of families usually live in the same house. There is a common staircase by which each family enters its own apartments. When the whole house is occupied by one family, the entrance is often into a kind of court, by a large gate, similar to the entrance into the houses in Paris. In the whole city of Stockholm I observed only two houses covered with slate. A sufficient proof that this is a scarce article in the country. Tiles are very common, and many houses are covered with wood cut into small square pieces, and laid on in the same manner as slates. This when painted looks almost as well as slates, and is no doubt warmer.

The houses are well finished within, and the rooms have an elegant appearance, though the furniture is in general very different from ours. However, in the hotel in which I lodged, when I was in Stockholm, for the second time, a good deal of the furniture was mahogany, and from the patterns they seem all to have been brought from England. The rooms are all in suites, and their mode of laying them out is sometimes a little awkward. For example, in the hotel where I lodged I had a couple of rooms, a bed room and a parlour. They were so contrived that there was no access to the parlour but through the bed room. So that all my visitors were obliged constantly to pass through the bed room before they came to the sitting room. But it must be observed that this is by no means so awkward in Sweden as it would be in England. For their beds are so small and so constructed that they may very well pass for settees. The most characteristic part of the room is the stove, which is always placed in a corner, and is so constructed as to serve as a kind of ornament. The one in my parlour had the shape of the pedestal of a pillar. It was 39 inches high, 32 inches broad, and $26\frac{1}{2}$ inches deep. The chimney which proceeded from it was continued to the top of the room in the form of a fluted pillar without any capital; being painted white and kept clean it looked very well, and would have been a great ornament to the room, had it not been for the want of a capital, which gave it an awkward appearance. The Swedes are fond of this kind of pillars; I saw several in the front of their houses. The doors of the stove were brass, and placed very near the floor; they were folding doors, each 16 inches long and $6\frac{7}{8}$ inches broad. Within them were two similar folding doors of iron plate. The fireplace is a rectangular parallelopiped, about the size of the doors, without any ash pit below, or passage to admit air other than the door: the vent is behind. At first it occupies the whole roof of the stove, but speedily becomes narrower; at the top there is always a damper by means of which the vent may be closed up at pleasure. During winter a fire of wood is lighted in this stove twice a day; as soon as it is burnt out the damper is shut. By these fires, assisted by

double windows and close doors, their rooms are kept comfortably warm all the winter. The consequence is that much more cold is felt in warmer climates during winter than in Sweden. A Swedish gentleman, who had passed a winter in London, told me that he never felt comfortably warm all the time. The case must be still more disagreeable in Sicily and Italy, where there are often no fire places at all and no means of warming a room however cold the weather may be.

As there are no taverns in Stockholm, if we except the English tavern, which is too small to accommodate any great number of persons, and as the hotels or lodging houses do not furnish you with dinner, a stranger is under some difficulty how to proceed. It is true that there are many ordinaries; but such places are at best but disagreeable to a foreigner who is unacquainted with the language; and are therefore nearly out of the question. On this account it may be worth while to mention two institutions which exist at Stockholm, by introduction to either of which all your difficulties are completely removed. The first of these institutions is called the *Societé,* the second the *Selskap,* which means the same thing, only the first word is French, the second Swedish. The first of these institutions belongs to the nobility, the second to the merchants. The second seemed to me upon the whole the preferable one. It consists of a club of five hundred individuals, who pay a certain sum annually, by means of which a set of apartments are kept up for their use. They have a considerable number of books, and get daily a variety of Swedish, German, Danish, Russian, French, and English newspapers, magazines, reviews, &c. which are left upon the table for the perusal of all the members. They have a dining room, where a dinner is prepared daily for as many of the members as choose to come to it. About fifty persons commonly sit down to dinner, though I have seen as many as two hundred dine together. The dinner is a very good one, and costs twenty-one pence sterling a head, besides which you pay for whatever wine, porter, ice-creams, coffee, &c. you choose to call for. Any of the mem-

bers has it in his power to introduce a stranger to this Selskap for a month, by making himself answerable for the propriety of his conduct while in the apartments of the society. By the goodness of Mr. Siderholm, a Swedish merchant, to whom I had a letter of introduction, I was introduced to the selskap, and regularly dined at their table when I was not otherwise engaged.

# CHAPTER VI.

## OF THE CHARACTER AND CONDUCT OF GUSTAVUS ADOLPHUS IV.

Erroneous Opinion of Gustavus entertained in Britain—His true Character—His Superstition—Military Ignorance—Quarrel with Prussia—His War with France—Conduct in Pomerania—Supposed Treaty for the Partition of Sweden—Russians invade Finland—Arrest of the Russian Ambassador—War with Denmark—Invasion of Norway—Arrival and Treatment of the British Auxiliaries—Projected Invasion of Zealand—Conquest of Finland by the Russians—Quarrel with Great Britain—Projected Invasion of Sweden.

BEFORE I went to Sweden I was strongly impressed with a high opinion of the late King of Sweden, Gustavus Adolphus IV. as it had been drawn with so much zeal and apparent truth in the British newspapers. I disapproved of the Swedish revolution, and was eager to learn the opinion entertained of it by well informed people in Sweden. I had many opportunities of conversing on the subject with people of all ranks, both Swedes and foreigners, who had the means of accurate information on the subject, and no motive whatever to disguise their real sentiments. I found every person concur in the same opinion, while the picture drawn of the conduct of Gustavus Adolphus was so different from what I had conceived from the statements in the English newspapers, that I was unwilling to admit it, and I yielded only to the evidence of well authenticated facts. Before I enter upon an account of the revolution itself, it will be proper to give a short account of the late king, and of his conduct during the whole of his reign,

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GUSTAVUS IV. ADOLPHUS.

*Late King of Sweden.*

*Engraved by J. Shury, for Dr. Thomsons Travels in Sweden. Published May 1st 1813.*

which at last brought the country into such a situation that nothing but the revolution could have saved Sweden from being divided between the Russians and the Danes.

Gustavus IV. possessed certain qualities which gave him a resemblance to Charles XII. the prince whose conduct he considered as a model for his imitation. Like Charles, he had an obstinacy of character so great that it was impossible to induce him to alter any resolution, however absurd or ridiculous, which he had once formed, even though it were demonstrated to him by the clearest evidence that persisting in it could lead only to disaster and ruin. Another quality in which he resembled Charles XII. was in his capacity of enduring cold, which was uncommonly great. He used to travel in the winter with only a slight covering, when his courtiers were trembling with cold under the load of two or three great-coats and surtouts. But in all the eminent qualities which distinguished Charles XII. there was a sad falling off in Gustavus IV. Instead of that impetuous bravery, bordering on foolhardiness, which characterized Charles XII. and to which at last he fell a sacrifice, Gustavus IV. was an absolute coward, and, though exceedingly fond of military glory, too timid to venture to appear at the head of his troops. Instead of that comprehensiveness of plan, and that celerity and steadiness of execution, which distinguished Charles XII. and to which he owed in a great measure his success, Gustavus IV. never attempted to form any plan whatever; and by frittering down his army into small detachments, and leaving them totally unsupported by each other, and to contend with forces more than double their own numbers, he always rendered success impossible. Instead of defending his own frontiers, he left them defenceless to the invading enemy, while the whole of his attention was turned to romantic schemes, altogether beyond the power of his resources to realize. He had early become the submissive votary of religion, or more accurately speaking, of superstition, and during his travels in Germany he got hold of a commentary on the Revelation, by a man of the name of Jung, which, though originally written in German, had been translated into Swedish. This book became the subject of

his assiduous study; the opinions which it contained were implicitly adopted, and regulated all his conduct. The second beast described in the 13th chapter of the Revelation, whose power was to be but of short duration, was considered by him as Bonaparte; because some commentator had shown that the letters in the name Napoleon Buonaparte make out the number 666, which is the mark of the beast.

In consequence of this discovery, he ordered the name of the French emperor in all the Swedish newspapers to be always printed N. Buonaparte, and as the real reason of this whimsical charge was concealed by his ministers, it excited considerable curiosity in the country, and nobody was able to explain it in a satisfactory manner. He easily persuaded himself that he was the person destined by heaven to overturn the dominion of the beast, and that the verse in the 6th chapter of the Revelation, which is as follows, applied to himself:

"And I saw and behold a white horse; and he that sat on him had a bow, and a crown was given unto him: and he went forth conquering and to conquer."

Gustavus IV. possessed some skill as a practical painter. At Gripsholm he drew a picture of himself seated upon a white horse, and trampling the beast under his feet. So firmly was he convinced of the truth of all these predictions, that he thought nothing more was necessary than to refuse to treat with Bonaparte. No preparations on his part would be requisite to enable him to fulfil the intention of heaven. When besieged in Stralsund by a French army, he expected the visible interposition of an angel in his behalf. But when this angel, who was to be four German miles in height, did not appear, and the French batteries were nearly completed, he thought it requisite to attend to his own safety, and retreat to the island of Rugen.

One of the greatest faults of Gustavus IV. was a total disregard to the sufferings and feelings of his subjects. All oppressions and all toils and hardships he conceived them as bound to endure without murmuring, and seemed to consider them as created for no other purpose than to fulfil his sovereign will and pleasure. His own notion of millitary tactics, like that of some other princes, was that

it consisted in nothing else than regulating the military uniforms: this was with him a point of such importance, that when the supplimentary troops were raised, he spent the greatest part of a year in devising the shape of their coats, while, in the mean time, the poor recruits were left so entirely without every means of comfort that many actually died of cold and hunger.

Let us now take a short view of the way in which he conducted the war against France, and afterwards against Russia and Denmark. This will lay open his conduct as far as the welfare of his country was concerned, and show clearly the necessity of a revolution in order to preserve any remnant of their country.

After the murder of the Duke d'Enghien, and the coronation of Bonaparte as Emperor of France, the King of Sweden returned the insignia of the Order of the Black Eagle with which he had been decorated by the King of Prussia, because that monarch had acknowledge the title of Napoleon, and had even bestowed upon him the Order of the Black Eagle. This step produced a coolness between these two kings, afterwards productive of the most disastrous effects during the subsequent war in Germany. Mean while he had recalled his ambassador from Paris, had prohibited the introduction of French newspapers, and had threatened to declare war against that powerful kingdom. Notwithstanding this disposition, he very nearly quarrelled at the same time with the Emperor of Russia, because the person sent with the badge of the Order of the Seraphim, which had been worn by the Emperor Paul, was not of a rank sufficiently elevated; and because Gustavus insisted upon painting with the Swedish arms that half of the bridge of Aborrfors which was on the Russian side. But this last quarrel was fortunately got over, and Gustavus entered keenly into the first coalition formed against France after the breaking out of the present war between France and Great Britain. The King of Sweden at the head of 25000 Swedes, and 15000 Russians, was to attack Holland. But after a sum of money had been paid him by the British ministry, Gustavus very nearly broke off from the coalition, because they would not declare that the object of the war was

the restoration of the Bourbons to the throne of France; but his eagerness for war induced him, at last, to wave this scruple and to proceed without any specific declaration.

A subsidiary treaty was concluded with Great Britain, and the King of Sweden with about 25000 troops, Swedes and foreigners, encamped in Pomerania, and issued a pompous proclamation. The King of Prussia being still irresolute, Gustavus sent a peremptory letter to him by Count Lövenhjelm, desiring to know his intentions, and informing him, that a Russian and Swedish army was going to take possession of Hanover. It is said, that the Emperor of Russia, who was then at Berlin, had just induced the King of Prussia to enter into his views. The British and Russian ambassadors, afraid that this letter, if delivered, might irritate the King of Prussia, and alienate him from their cause, prevailed upon Count Lövenhjelm not to deliver it, and the King of Prussia was led to conceive that he had been sent not to him but to the Emperor of Russia. Count Lövenhjelm wrote to the King of Sweden, and urged him to recal the letter, but Gustavus wrote back a peremtory order to deliver the letter, and observed, that he was not a man to put up with a refusal to receive his letters.

The King of Sweden was so much provoked that he threw up the command of the Russian troops, and refused to allow any Swedish troops to leave Pomerania. At last the Russian minister, Alopæus, in some measure pacified him by receiving the letter, and promising to send it to the King of Prussia. In consequence of this misunderstanding the projected invasion of Holland was prevented, and an army of troops, paid by Great Britain to act against France, was recalled without attempting any thing.

At last a declaration was obtained from Prussia, that no attack was intended upon Pomerania; but still the King of Sweden continued to negotiate, insisting upon a declaration, from that power, that the Swedish troops would not be molested in Hanover or on their march to Holland. The Swedish troops were then allowed to approach Luneburg; the king regulated their line of march himself, and frequently ordered them to stop for the night in villages that did not

exist. No provisions were provided, and they who were ordered to form magazines were left ignorant where they were to be placed; the guards and king's regiment were left without shelter at the end of November, and in the most dreadful weather.

Mean while after the surrender of Mack, the capture of Vienna, and the battle of Austerlitz, the Swedish troops were ordered to march into Hanover. They took possession of Harburg, and attempted the most iniquitous exactions, which it was found impossible to enforce. The Emperor of Austria had been forced to accede to a treaty dictated by Bonaparte, and the Emperor of Russia had retired in disgust to Petersburgh. The situation of the Swedes became critical. Louis Bonaparte menaced them in front, while Augereau and Baraguay d'Hilliers threatened their rear. Thus situated, Gustavus offered to resume the command of the Russian troops, but was informed that it had already been bestowed on the King of Prussia, who had expressed his determination to occupy Hanover, and protect the north of Germany from the war.

The British troops, who had never lost sight of their transports, returned home; and the British ministry intimated to Gustavus that any attempt on his part to protect Hanover was superfluous; but his enmity to Prussia induced him to remain on the left bank of the Elbe. He insisted that the King of Great Britain should officially desire him to retreat; but was informed that such a step would be authorizing the King of Prussia to occupy Hanover. The Prussians continued to advance: Gustavus prudently retired himself, but left Count Lövenhjelm with 1800 men, and peremptory orders to fire upon the Prussians if they attempted to cross the Elbe. A long negotiation took place with the British ministry which it is needless to detail: mean while the Swedish troops were all withdrawn except about 300; the Prussian alliance with France became publickly known; the troops of the King of Prussia advanced, refused to fire upon the Swedes, opened a passage for them to retire, and when the Swedish soldiers fired and prepared to fight, the Prussian officers declared, that there was no wish whatever of entering into hostilities with Sweden. Gustavus immediately

blockaded the Prussian ports, and ordered the towns upon the coast to be bombarded, unless they agreed to pay for their security. This extraordinary step was persisted in notwithstanding the remonstrances of Great Britain and Russia, and notwithstanding the risk of the loss of Pomerania; till at last the King of Prussia, who was now preparing for the impending conflict with France, agreed to evacuate Laüerberg. The Swedish troops took possession of that dukedom, and soon after Count Lövenhjelm occupied Ratzeburg.

The King of Prussia was now too far advanced in his unfortunate and fatal quarrel with France, to pay any attention to the petty efforts of the King of Sweden. During the short but decisive war between Napoleon and Prussia and Russia, nothing short of infatuation can account for the conduct of Gustavus. He was urged repeatedly by the French to make peace, and offered his own terms. How far the French were sincere in these offers it is impossible to say. For my part, I firmly believe that if the King of Sweden had entered zealously into the new system which Bonaparte established immediately after the conquest of Prussia, and had excluded all British vessels from his harbours, in that case Bonaparte would have allowed him to retain his territories, and he would have avoided the Russian and Danish war. The consequence would have been that the Baltic would have been more completely shut against British commerce, and Russia would have been obliged to alter her politics at a more early period than she has done. She might have even made common cause with Austria in the late short and disastrous war which that power carried on against France. It was probably fortunate for Europe that this did not happen. So miserably poor was the conduct of Austria, such a want of abilities, firmness, and patriotism was displayed by the Emperor of Austria and his family, that no assistance either from Russia or Britain would have been of the least avail. The late invasion of Russia, and the loss of three or four hundred thousand men was a greater blow to Bonaparte than could have been inflicted by any two of the continental powers united against France.

During the whole of the Prussian war the Swedes remained quiet, in

Pomerania, in consequence of an armistice with the French army in that district. But as soon as the peace of Tilsit was concluded, the King of Sweden declared the armistice at an end, and refused either to renew it or enter into any negotiation with the Emperor of France. The Swedish troops, amounting to a few thousand men, were speedily driven into Stralsund, and that town, which had been entirely neglected, was not capable of making much defence against a besieging enemy. But the King, relying upon assistance from Heaven, refused either to give it up, or to make any preparations to defend it. But when the French advanced, and began to throw up batteries, he prudently withdrew to Rugen, and soon after the town was abandoned to the enemy.

About 8000 British troops were lying in Rugen, under the command of Lord Cathcart. The British Ministry formed the project of seizing the Danish fleet at Copenhagen, and sent a sufficient fleet and army for that purpose into the Baltic. The command of the army was given to Lord Cathcart, and he was ordered in consequence to withdraw his troops from Rugen, and land them in the island of Zealand. This order being communicated to the King of Sweden, he not only refused to allow them to go; but though he had only 800 Swedes at most, threatened to throw the whole British army into prison. At last he was pacified, the British troops were carried to Zealand, and the result of the expedition is sufficiently known. The King of Sweden withdrew to Sconia; and the island of Rugen, not being capable of defence, was speedily evacuated by the Swedish troops.

It was firmly believed by all the Swedish gentlemen with whom I conversed on the subject, that at the meeting at Erforth, between Bonaparte and the Emperor of Russia, it had been agreed upon that Sweden should be divided between Russia and Denmark, and that the River Motala and ridge of mountains that runs north from it, should be the boundary between these two kingdoms. Be this as it may, there can be no doubt that at the treaty of Tilsit it had been agreed upon to force Sweden to accede to what Bonaparte chose to call the continental system. Russia speedily announced this resolution to the King of

Sweden, and urged him to unite with Russia and Denmark, in an armed neutrality, similar to that of 1780 and 1800. This Gustavus had peremptorily refused. He must have been aware therefore, from the beginning, of an impending war with Russia and Denmark; yet no preparations were made to resist the threatened invasion. Unless we consider a treaty with Great Britain, and a subsidy from that power of 1,200,000*l.* annually as a preparation.

The war lasted little more than a year, and notwithstanding the prodigious disparity of force, if we consider the situation of Sweden, the zeal of her population, and the great number of troops she had on foot, not fewer than 100,000 men, there can be little doubt that, with common prudence and with the assistance which they would have received from Great Britain, they might have been able victoriously to oppose the enemy, and maintain the integrity of the Swedish dominions. But the conduct of the King bid defiance to all prudence and common sense, and made it impossible either for his generals or ministers to be of the least service to their country.

The Russians invaded Finland on the 11th of January 1808, with an army of about 30,000 men. The Swedish troops in that country amounted to 9540 men, 6261 of whom were posted in the north, and 3279 in the south. Besides this, Sveaborg, a very strong fortress, built upon several islands, on the south coast of Finland, had a garrison of 6000 men. The small band of Swedish troops near the southern frontier, under the command of Lieutenant-General Von Klercker, retired before the enemy, after making a gallant and spirited resistance. The object was to make good their retreat into East Bothnia, in order to join the Finnish militia, and the army of the north. General Count Cronstedt, who retreated by another road, succeeded in his object, in spite of the inclemency of the season, and the opposition of the enemy, and joined the main army with little loss. Field Marshal Count Klingspor took the command of the division led by Von Klercher, at Tavastehus. It was repeatedly attacked by the Russians, particularly at Pyhäjocki and Sikajocki. In the last of these General Adlercreutz distinguished himself at the head of the Finns; broke through the centre

of the Russians, took several hundred prisoners, and compelled the rest to retreat. No immediate attempt however was made by the King of Sweden, either to reinforce his small army in Finland, or to concentrate his troops for the defence of his kingdom.

But as soon as he heard of the invasion of Finland by the Russians, without any previous declaration of war, he immediately ordered Mr. Alopæus, the Russian Minister, to be confined to his house, his papers to be seized, and information to be given to him, that he had no longer any diplomatic character. The Governor of Gottenburg was ordered to seize the papers of the Russian Consul, and to confine him to his house. A courier sent from Russia to the Russian Ambassador at Stockholm was arrested, and his dispatches published. Next day, a declaration of war on the part of Denmark was received. The Danish Ambassador was ordered to leave the kingdom, and the hour of his departure fixed, and these orders were conveyed to him by means of a military officer.

Meanwhile the whole of South Finland was occupied by the Russians; the important fortress of Sveaborg was shamefully given up by the treachery of Vice-Admiral Cronstedt; and the islands of Oland, which were not defended by any military force, were occupied without opposition by a detachment of Russians. As the season advanced, when the ice round these islands began to break up, and all communication with the neighbouring continent was interrupted, the inhabitants rose upon the small Russian force left to protect their conquest, and made them prisoners of war. Thus these islands were recovered without difficulty, and the same thing happened to some Russian soldiers who had landed in the island of Gothland, and taken possession of it.

But Gustavus was now intent upon the conquest of Norway, and of the Danish islands in the Baltic, and therefore gave himself little concern about what took place in Finland. The Swedish army on the western frontier, amounting to about 12500 men, were ordered to enter Norway, in two bodies, and they were spread over so great an extent of country as to form a very weak and inefficient line. They

gained some advantages at first, but being left totally unsupported, and even without a supply of provisions, they were soon obliged to retreat into their own country, and take up a defensive position. Gustavus had already altered the whole of his plans, and had determined, with the assistance of a body of British troops, to invade and conquer the island of Zealand.

He had from the commencement of the war solicited an increase of the subsidy from Britain, and a body of troops to enable him to oppose his enemies with more efficacy. The Swedish Ambassador at London, aware of the desperate state of his country, had prevailed upon the British Ministry to send 10,000 men to Gottenburg, under the command of Sir John Moore, pledging himself that they would be immediately landed and treated with the greatest attention at Gottenburg, till a plan for their future services should be concerted between the King of Sweden and Sir John Moore. The troops were accordingly sent under the following conditions, stipulated by the English Ministry: That the troops should be under the immediate command of their own general, that they should not be obliged to march to any great distance from their transports and vessels of war, and that it should be in the power of the British Ministry to recall them whenever their services should be requisite in any other quarter. When the British troops arrived at Gottenburg, the King of Sweden prohibited them from landing; and when he was applied to for the purpose by the British Ambassador, he answered that he considered the application as an insult, and expected therefore that it never would be repeated. Sir John Moore came to Stockholm to form a plan of operations with the King. The first proposal of Gustavus was, that the British troops should unite with a Swedish army, and invade the island of Zealand. Sir John Moore answered, that he was expressly prohibited by his instructions from joining in any such scheme. This refusal greatly irritated the King, as it thwarted his favourite project, from which his ministers and generals had in vain attempted to divert him, by showing that he was not provided with a sufficient quantity of troops, or warlike engines, to make an attack upon Copenhagen with any chance of success.

His next proposal was that the British troops should land in the neighborhood of Petersburgh, in order to make a diversion in favour of the Swedish army in Finland. Sir John Moore declined this plan, observing that it was very well conceived, if the object of the King was to give the Russians some thousand British prisoners of war; but that the neighbourhood of Petersburgh was at too great a distance to be of any service, as a diversion to the Finnish army.

Driven from these two objects, the King of Sweden again turned his attention to Norway, and proposed that the British troops in conjunction with the Swedes should make a new invasion of that country. Sir John Moore replied, that the British troops had been already confined for two months on board their transports, greatly to the injury of the health both of the men and horses; that it would be the beginning of August before the Swedish troops could be ready to take the field, a period much too long to continue on board the vessels. On that account since the King of Sweden had no immediate occasion for the British troops, he was determined in obedience to the orders of his own government to return home. The King urged him to remain at Gottenburg, at least till new dispatches arrived from the British Government. Sir John Moore at first consented to this; but when he went home, and considered the orders of the English Ministry which he had received, he conceived himself bound to return home directly without waiting for any farther orders, unless the British troops were immediately permitted to land. He wrote a note to that effect, to Mr. Thornton, the British Ambassador at Stockholm, who laid it before the King. Gustavus was incensed, and without farther ceremony ordered Sir John Moore to be confined to his house. Strong remonstrances on the absurdity and danger of this step were made by Mr. Thornton; but without effect. At last Sir John Moore made his escape to Gottenburg, and the British troops returned home to England.

All this while Finland and the Swedish army in that country were abandoned to their fate, while 15000 Swedish troops lay in Sconia because the king had again resumed the project of invading Zealand. With this small army he proposed to besiege Copenhagen

and conquer Zealand: the proposal was referred to a committee who pronounced it altogether impracticable. Supposing it even possible for this little army to take Copenhagen, it was clear that they could not keep it, because the Danes had it in their power immediately to besiege them with a much greater army. Gustavus sailed for Oland, and after writing some ridiculous letters to the Russian general, and sailing about for weeks in quest of the Swedish galleys, he at last established his head quarters at Grelsby. Mr. Thornton had recommended opening a negociation with the Russians and Danes; but Gustavus treated the proposal as an insult, quarrelled with Mr. Thornton, and insisted upon his recal, a demand which was soon after complied with by the British ministry.

The army in North Finland had all this time been left to itself, yet it had begun to oblige the Russians to retire; and had it been properly reinforced, there can be little doubt that Finland might have been recovered. Two expeditions were indeed sent out by the king for the recovery of South Finland, consisting each of a few hundred men; one to land at Obo the other at Vasa; but they were too insignificant to accomplish any thing, and served only to diminish the strength of the Swedish army. Early in the summer the Russians in North Finland, who had been much weakened by their winter campaign, were not able to stand their ground before the Swedish army, which, including the Finnish militia, amounted to about 13000 men. The Swedes recovered a considerable space of ground, and conducted themselves with the utmost gallantry and skill; but they were left totally unsupported, and by the month of September were reduced by continual fighting to about 6000 men. All the losses of the Russians had been supplied, and they were now stronger than when they first entered the country. Some trifling expeditions were indeed sent to assist the Swedes; but by the express orders of the King, they were obliged to land at so great a distance, and to fight their way through so great a space, that they were destroyed piecemeal without being of the least service to the common cause of Sweden. *Baron Vegesack*, indeed, at the head of six battalions, by disobeying the King's com-

mands ad landing at Christinestadt instead of Björneborg, succeeded in reachig the northern army, when it was driven almost to the polar circle, ar quite unable to oppose the Russians. The king upon this occasion xpressed the greatest displeasure that his orders had not been exactly oeyed, though it was demonstrated to him, that if the troops had landd at Björneborg not one of them could have escaped the Russian oops.

South inland, which was already lost, and covered with Russian troops, ws more an object of consideration with him. He sent a standard earer to Obo to collect information respecting the state of the county: this man brought back intelligence that 13000 peasants were ead to rise in arms against the Russians. He sent back this man and ne of his life guards to take the command of this supposed army of pasants; two thousand six hundred troops were to be sent at the same me under the command of Count Lantingshausen. These troops wer supplied with only sixty rounds of ball cartriges apiece: and, thoug the General remonstrated on the insufficiency of such a supply, wh ch would be exhausted immediately, he could procure no more. Thi little army was ordered to land at Lokalax, take Obo, and then to jo n General Vegessack's corps. After various delays, this small body f men landed at Varanpä, and took possession of a strong fort about four miles from the place of debarkation. They were immediately attacked by the Russians, who were repulsed; but the Swedish ammunition being speedily expended, while the number of their enemies had increased, they were obliged to return to their transports, which they effected without loss.

An army of 6000 men was collected at Gefle, and ordered to sail to the northern coast of Oland, where they would find ships that would make them acquainted with their destination. They did so, but found no vessels at the appointed place. The orders given to the different commanders were inconsistent and contradictory, so that they had no means of divining the object of the expedition. A storm arose and scattered the transports, some were wrecked, and some totally lost. Meanwhile two sets of orders had been issued by the King; one or-

dering them to the north, and the other to the south. One battalion and two companies of Colonel Skjöldebrand's brigade meeting at sea with the vessels carrying the first orders, joined the army in the north; but only served to increase the confusion, arising from the want of provisions and resources of every kind. Most of them perished in these dreary regions, not more than 90 returning again to Sweden.

I shall pass by several other expeditions to Finland, undertaken during the course of this year, all of them small, and all of them as injudiciously contrived as possible. Had the object of Gustavus been the loss of Finland, and the destruction of the Swedish army, he could have taken no steps better calculated to accomplish them. No valour on the part of the Swedish troops, no skill on the part of their commanders, could be of any avail: because, by the consummate folly of the King, they were exposed every where to ten times their number of Russian troops, without any of the requisites which constitute an army; and every expedition was left to its fate without inquiry and without reluctance. The Swedes are unanimously of opinion that Finland was lost, and their army ruined, by the extreme folly and incapacity of the King; that the resources of the country were quite sufficient to have defended it; and that the Swedish army, had it been judiciously placed, would have bid defiance to all the efforts of their enemies, at least for several years. But Gustavus was dreaming of conquests, and his eager desire to copy after the example of Charles XII. could ill brook the idea of defence, to which in his circumstances, any king of common sense would have restricted himself. Of all the race of Gustavus Vasa, he was by far the weakest that had ever sat upon the throne of Sweden, whilst his passion for war, and the erroneous opinion that he had formed of his own abilities and qualifications, made him the most injurious to his country of any prince that Sweden had ever obeyed.

I am conscious that this picture of the conduct and capacity of Gustavus IV. is very different from what is generally entertained in this country. It is very different from what has been uniformly inculcated in all our newspapers, and, indeed, as different as possible from the

opinion which I myself entertained before I went to Sweden. But it is an opinion which must be adopted by every person who will make himself acquainted with the facts which took place in Sweden during his reign. I have already stated a considerable number of these; but more are still wanting to complete the picture.

In consequence of the quarrel between Mr. Thornton, the British ambassador, and Gustavus, that gentleman had been recalled by the British government, and Mr. Merry sent out in his place. In his first conversation with the King of Sweden, that monarch, whose finances were in the most deplorable state, imperiously demanded an increase of the subsidy advanced to him by Great Britain, and the immediate payment of a sum of money to answer his exigencies. Mr. Merry informed him that he had no powers to enter upon any such negotiation; but to prevent an immediate quarrel between the two countries, he allowed him to draw bills for 300,000*l.* without any orders from his own government. These bills were returned dishonoured by the British ministry, and a note was written at the same time, advising Gustavus to make peace with the belligerent powers, assuring him that the British ministry would with pleasure release him from his engagements, and keep up the usual communications between the two kingdoms, even supposing him to make peace with France and Russia. Gustavus was indignant at this note. He again declared his unalterable resolution never to make peace with Bonaparte or the Emperor of Russia. He immediately ordered an embargo on the British merchant ships at Gottenburg, commanded that pilots should be refused to the British ships of war, and that if they attempted to sail without pilots they should be treated as enemies. He wrote a letter with his own hand to the King of Denmark, informing him that he was already at war with England, and requesting an immediate cessation of hostilities, and a negociation for peace. But before this letter was sent off he received information that the Danes had circulated revolutionary proclamations in Sconia. He immediately tore his letter in pieces, recalled the embargo of the British vessels, and entered into a new treaty with the British minister.

The crisis of Sweden was now at hand. The Swedish army in Finland had been driven out of the country and nearly annihilated. The army of the west had been equally unsuccessful in Norway, and the Norwegians had actually invaded Sweden. The Swedish supplementary army of 30,000 men had been nearly destroyed, partly by want of clothing and exposure to severe cold, and partly by being sent upon services quite unsuitable to the tender age of the troops, who were mostly boys not more than 19 years of age. The treasury was absolutely exhausted, and the violent taxes to which the king had recourse were so tyrannical and unjust that they could not be levied. The whole money remaining for carrying on the war, I have been credibly informed, did not exceed 2,000 *l.* sterling. Mean while four separate armies were preparing to invade the kingdom on every side. Two Russian armies were ready to march; the one from Obo over the ice was destined to take possession of Stockholm, an open town and incapable of any defence; the other was to proceed from the north and fall down upon Dalecarlia and Nerike. A French and Danish army in conjunction were to cross the Sound upon the ice. But they were fortunately prevented by the sudden breaking up of the ice, and the appearance of some British ships of war. Finally, the Norwegian army under the command of Prince Augustenburg was to take possession of Wermeland and West Gothland. Such was the weakened state of the Swedish army, which in one year had been reduced from about 100,000 men to a comparatively small number; such the discontent both of the officers and men; such the want of provisions and ammunition, that very little resistance could have been opposed, and Sweden must infallibly have been overrun and divided. In this dreadful dilemma, when no hope was left, the country was saved by an unforeseen revolution, which wrested the sceptre from the unworthy hands of Gustavus, and saved the country from partition by a speedy and necessary peace. I shall give an account of this revolution, with as much precision as my information on the subject will permit, in the following chapter.

# CHAPTER VII.

## ACCOUNT OF THE REVOLUTION.

Necessity of a Revolution—Unpopularity of the King—Conspiracy in the Army—Conspirators in Stockholm—March of the Western Army—King alarmed—Determines to retire to Nyköping—King seized by Baron Adlercreutz—King makes his escape—Again seized by the Conspirators—Peace concluded—Abdication of Gustavus IV.—Duke of Sudermania made King—Prince Augustenburg, Crown Prince—King leaves Sweden—New Constitution—Death of Prince Augustenburg—Election of Bernadotte—His Character and Views—Swedish Army.

IT is a fundamental maxim in the British constitution that it is the duty of a prince to promote the welfare of his subjects and country; and that whenever his conduct becomes unequivocally inconsistent with the interests of his people, resistance becomes not only innocent but an indispensable duty. It was by this maxim that the revolution of 1688 was justified, which hurled the family of the Stuarts from the throne, and introduced a new and a foreign dynasty. Never did a greater necessity for a revolution exist in any country than it did in Sweden in the beginning of the year 1809. The finances of the country were in the most deplorable state, the army was harassed and cut up in detail, as if it had been the professed object of the King to annihilate it. Three powerful nations were preparing to invade and divide the kingdom of Sweden among them. Gustavus had quarrelled with his only ally, and obstinately refused to listen to any terms of peace with France and Russia; though it was demonstrated that such a

peace was essentially necessary for the interests of his country, and that perseverance in the war could lead to nothing else than complete ruin.

The liberty of the press had been totally annihilated in Sweden, so that the people in consequence were but imperfectly acquainted with the state of Europe. The King had all along been very popular with the people, who, ignorant of his real character, ascribed all his errors in Germany to the want of capacity of his ministers. Even the commencement of the Russian and Danish war did not alter their sentiments, and the losses sustained in Finland served only to irritate the minds of the people. Popular enthusiasm was raised to the highest pitch, and the most glorious results would have taken place had the throne been filled by a prince who understood how to profit by the disposition of his subjects. But the management of the war in the summer and autumn of 1808 opened the eyes of the whole Swedish nation. The army were disgusted with a prince who expected from them impossibilities, who paid no attention to their lives or their comforts, and who refused to share the toils and hardships to which he exposed them. The barbarous treatment and cruel fate of the supplementary army excited the compassion of all ranks, and raised a corresponding abhorrence at the unfeeling mind of its author. The deplorable state of the finances, the determination of the King never to make peace, and the absurd plans which he had projected for the next campaign, awakened in the mind of every thinking man the necessity of taking some immediate step to save their tottering country.

It was impossible to obtain in Sweden any very satisfactory account of the origin of the conspiracy. Every body asserted that the Duke of Sudermania was altogether unacquainted with it. This is possible, though from the subsequent conduct of that prince I can hardly bring myself to believe that this was the case. The two gentlemen, from whom my principal information was obtained, were neither of them actors in the conspiracy; though they took a very active part in the framing of the new constitution, and one of them indeed was for a short time a Secretary of State. I must satisfy myself with giving the

particulars, such as I learned them, without being able to throw much new light either upon the origin, or the names of the original conspirators. But the conspiracy appears to me to have originated in the army, and to have been very general all over the kingdom. The actors in it were all officers in the army, and even some battalions of common soldiers were let into the secret.

Various projects and consultations about a revolution took place at different times, and were so publicly talked of, that if the government of Gustavus had possessed the least vigilance, the whole project must have been discovered. Different schemes were proposed and abandoned in succession, and the ardour of the conspirators began to cool. At this time an officer of high rank, in the disguise of a servant, to his own adjutant, arrived from the army of the north. He found about twenty persons in Stockholm anxious to bring about a revolution; but not determined either about the time or the measures to be pursued. After some consultation, the different sentiments of this body were reconciled, and the 8th of February appointed for putting their plan in execution. The King was to be arrested opposite to a particular tavern on his way to Haga, a palace where he almost always resided, in consequence of a disgust which he had conceived against his capital.

Mean while the western army, having concluded a truce with Prince Augustenburg, the Governor of Norway, published a manifesto, stating their grievances, and their determination to redress them, and began their march for that purpose towards Stockholm. The leaders of this army seem to have corresponded with the conspirators in Stockholm, and to have been perfectly aware of their designs. That the motives of all the conspirators were not of the purest kind, and that several of them were in the interest of France and Russia, is generally admitted. I could even mention the names of some who were most vehemently suspected of being in the pay of France; but am prevented from taking such a step from motives of delicacy, lest I should injure innocent men by accusations founded only on vague report, and drawn chiefly from the proposals which they made to bring about the revolution by dissolving the government.

Colonel Adlesparre, who commanded the western army, conducted his troops to Carlstadt, harangued the different regiments in succession in the market place, informed them of the hazardous enterprize which he had undertaken, and the necessity of such measures for the safety of their country. The troops unanimously entered into his views, and offered to sacrifice their lives for the salvation of their country. A detachment was sent to take possession of Gottenburg, while Colonel Adlesparre marched with the rest of his army to Örebro. Mean while the spirits of the conspirators in Stockholm had failed them, and they had allowed the 8th of February to pass by without attempting any thing.

On Sunday the 12th of March, an extra post arrived in Stockholm with the proclamation of the western army, and a full account of their proceedings. In the afternoon the King went from Hagu to Stockholm, and as soon as he entered the palace ordered the gates to be shut; guards were placed at all the avenues of Stockholm, with orders to allow no person to enter without the strictest examination, and to permit no one, whatever, to leave the city. All the great officers of state were ordered to repair to Nyköping, all the troops were to be withdrawn from Stockholm, and a German regiment was ordered to oppose the western army. The King was upon the point of seizing all the money in the bank and of erecting his standard at Nyköping; the consequence would have been a civil war added to all the other miseries to which Sweden was already exposed. The conspirators, at Stockholm, were sensible that the King's retreat ought at all hazards to be prevented, and, therefore, resolved upon attempting to seize his person next day, the 13th of March, before he should have leisure to put any of his plans in execution. Baron Adlercreutz, who had come to Stockholm on purpose, and who had acquired reputation by his conduct in the Finland war, agreed to take the lead on this occasion.

Baron Adlercreutz, Count Klingspor, Colonel Silfversparre, and many other officers who were in the secret, assembled in the palace by eight o'clock in the morning. Only four of the life guards remained in the

palace, the rest having gone to prepare themselves for their journey. The number of conspirators within the palace amounted to about fifty. Little danger was to be apprehended from any opposition which these four men could make. The gates of the palace had been shut by the King's command. The conspirators assembled in considerable numbers in a room adjoining the King's bed-chamber; Count Ugglas was first called in to his Majesty; the Duke of Sudermania soon after arrived and went in to the King, just as Count Ugglas came out. It is said that the Duke was requested, by Baron Adlercreutz, to remain in the palace; but that he declined, saying, he had received orders from the King which must be immediately executed. Baron Adlercreutz insisted that Count Ugglas should remain, informing him, that a moment of infinite consequence approached, and that the King must be prevented from leaving Stockholm; Count Ugglas said, that he had used every endeavour to persuade the King to stay, but in vain, and begged that any further remonstrance might be offered with caution: the Baron answered, that it was now intended to speak to the King in a manner which he thought would be effectual. When the Duke of Sudermania came out, Count Klingspor was called in to his Majesty, and during the conversation strongly represented the imprudence of leaving the capital. Baron Adlercreutz now went round and desired those who were stationed at the gates and the other parts of the palace to be vigilant on their parts, and having collected a number of officers, he entered the King's room. When the door opened the King seemed surprised; the Baron immediately approached and said, "That the public mind was in the utmost irritation from the unfortunate state of the country, and particularly from his Majesty's intended departure from Stockholm: that the higher officers of state, the troops, and the most respectable citizens had encouraged him to represent the consequences to his Majesty, for which purpose"—here the King loudly exclaimed, "Treason! you are all corrupted and shall be punished!" The Baron answered, "We are no traitors, but wish to save your Majesty, and our country." The King immediately drew his sword, the Baron rushed upon him and seized him round the waist, while Colonel

Silfversparre took the sword out of his hand; the King then cried out, "They are going to murder me, help! help!"—They endeavoured to re-assure the King, and he promised to be more composed if they would return his sword; this request they endeavoured to evade, and when the King obstinately insisted on it, he was told that in this respect he could not be gratified, nor be permitted any more to interfere in the management of the kingdom.

The King's outcries had alarmed some of the body guard, who had just arrived, and the servants of the palace, who endeavoured to force open the door; but not being able to succeed, they broke the upper pannel with pokers and sabres. Baron Adlercreutz commanded the door to be opened, and rushed into the middle of the crowd, seized a sabre from a hussar, snatched from the Adjutant-General his staff of office, and holding it up before him said, that he now considered himself as Adjutant-General, and in that capacity, commanded the guards to retire; this command was obeyed with some hesitation, and several officers who were not in the conspiracy were put under arrest. The Baron then went up to the room where the guards usually assembled; he assured them that the King's person was not in the smallest danger, and that the only object in view was to save the country from ruin; he conjured them not to attempt any thing that might occasion bloodshed and endanger the life of the King. After some hesitation and argumentations, the Baron had the address to persuade them to remain tranquil. Proper regulations were then made for the security of the capital. The citizens mounted guard at the bank and publick offices, and the streets were kept quiet by patroles of the burger cavalry and cuirassiers, who had orders not to molest any person who was not openly riotous.

Mean while the King had entreated to be spared the mortification of seeing the officers who had been concerned in his arrest, and who had been left with him by Baron Adlercreutz in order to secure his person. They retired in consequence, and Count Ugglas and General Count Strömfelt were sent in to his Majesty to endeavour to tranquillize him. The King contrived to draw General Strömfelt's sword from the scab-

bard, and when the General missed it, and entreated to have it returned, his Majesty answered, that the General was just as good a general as he a King without a sword. Baron Adlercreutz, who had just returned, being informed of the circumstance, thought it necessary that some officers should be placed in the room as a guard upon the King. He went out accordingly to procure them, and the King, seeing him return with two officers through the door that had been demolished by the guards, immediately made his escape through the opposite door, and locked it behind him.

The Baron was alarmed at the danger which would result from the escape of the King, leaped against the door and burst it open, and ran in pursuit of him. In the next room there is a spiral staircase, open all round, which leads up to the floor above. When the Baron entered the room, he saw the King on the highest step of this stair. He threw a bunch of keys in the Baron's face, and immediately disappeared. When Baron Adlercreutz got to the top of the stair, the King was no where to be seen. By accident he took the same road as the King, and meeting some servants in the way, was by them directed in his pursuit. But he reached the court of the palace without having seen the King. Gustavus had been so precipitate in his escape, that he fell in the stair and hurt his arm severely.

When the King's escape was made known, the whole conspirators were filled with consternation, and rushed in a body to the court of the palace to endeavour to intercept his Majesty's flight. Greiff, keeper of the King's game, had precipitately descended the great stair, and was the first that reached the court. He saw the King, with his sword in his hand, making towards the only gate that had been left open. As soon as Greiff overtook him, the King made a violent push at him, but with so unsteady an arm, that the sword passed up the sleeve of Greiff's coat, and only slightly wounded him. His sword being thus entangled, his breath gone, and his strength exhausted, he was easily overpowered. He was carried up stairs, and at his own desire taken into the white room. He was there set down upon the chair nearest the door, and exactly opposite to the portrait of Marie An-

toinette, the late unfortunate Queen of France. He remained quiet the whole day. Not the smallest disturbance took place in the capital, no displeasure was testified by the people, and the theatre in the evening was crowded by an unusual number of spectators.

The Duke of Sudermania took upon him the government. The change was immediately proclaimed, and received with acclamations by the people. Hardly any revolution was ever brought about with greater facility. No tumult ensued; no blood was shed in any part of the kingdom, and not a single murmur expressed at the dethronement of the King. At two o'clock in the morning, the King was conveyed to Drottningholm, and a few days after to Gripsholm. Intelligence of the revolution was dispatched all over the kingdom, and Baron Von Döbeln, who commanded in Oland, was requested to endeavour to conclude an armistice with Russia. One Russian army was descending from Torneo, another was crossing the Gulf of Bothnia upon the ice, and the little Swedish army in Oland was surrounded by 30,000 Russians. The Russians insisted that the Swedish troops in Oland should surrender prisoners of war; but Von Döbeln declared, that sooner than submit to such terms, he would put an end to the negotiations, and fight to the last man. Considerable difficulties took place in the negotiations with Russia; but as the result of them is well known, and likewise the terms upon which peace was concluded between Sweden and Russia, I conceive it needless to enter into any particulars. Soon afterwards peace was concluded likewise with France, and with Denmark.*

Most of the Swedish ministers retained their places, and every proper precaution was taken to quiet the minds of men, and prevent those commotions which even the mildest revolution never fails to provoke. A proclamation of the Protector announced that the war taxes were

* In the preceding account of the conspiracy, I have followed the details published by the Swedish government, in a book, entitled, *An Historical Sketch of the last Years of the Reign of Gustavus IV. Adolphus.* A book lately translated into English. They obviously come from the conspirators; but none of the persons from whom I had my information were acquainted with the minute details.

not to be levied, and on the same day the States of the kingdom were in the usual form summoned to assemble at Stockholm, on the 1st of May. An account of the state of the nation was published on the 15th of March. A proclamation on the 20th of the same month informed the nation of the necessities of the state; and partly by loan, partly by contributions of money, trinkets, and jewels, the sum of 300,000 rix-dollars, or about 50,000*l.* sterling was immediately raised to defray the immediate exigencies of government.

On the 29th of March, Gustavus Adolphus voluntarily abdicated the throne of Sweden. The terms of the abdication which was written by the King himself, are so characteristic of the man, that I shall here insert a literal translation of the paper:

"In the Blessed Name of the Most Holy Triune God.

"We Gustaf Adolph, by the Grace of God, King of the Swedes, Goths, and Vandals, &c. Duke of Schlesvig, Holstein, &c. make known, that since on this day 17 years ago, we were proclaimed King, and with a bleeding heart ascended a tenderly beloved and revered father's bloody throne, it has been our endeavour to advance the prosperity and honour of that ancient kingdom, indispensable to the happiness of a free and independent people. As we can now no longer exercise the Royal functions, according to the purity of our intentions, nor preserve peace and order in the kingdom, in a manner worthy of ourselves and our subjects, we consider it a holy duty to resign our kingly calling, which we now do freely and without compulsion, in order that we may be enabled to live the remainder of our days to the honour of God, wishing to all our subjects the grace and blessing of the Almighty, and better times to them and their posterity. Yes! *Fear* God and honour *the King*. For further proof, we have composed with our own hand, subscribed, and with our Royal seal confirmed, these presents.

"At the palace of Gripsholm, the 29th day of March, in the year after our Lord and Saviour's birth, one thousand eight hundred and nine.

"GUSTAF ADOLPH ⋈."

In taking our lieve of Gustavus, it may be necessary to observe that his moral character was excellent, and that in ordinary times he might have swayed the sceptre without much injury to his country. But his madness, which betrayed itself in the whole course of his actions, the obstinacy of his temper, and his violent thirst for glory and conquest, without a single quality capable of insuring them, rendered him totally unfit to reign in the times when he lived, and justified the revolution by the imperious necessity of saving the country from immediate destruction.

The States renounced their allegiance to Gustavus, and his uncle, the Duke of Sudermania, was raised to the throne, under the title of Charles XIII. This prince was old, and so feeble from a long course of early debauchery in which he had indulged, that his reign could not be expected to be of long continuance. It was therefore necessary to choose a successor. Great difference of sentiment existed on this point. Some were against any present election altogether. But the majority were of a different opinion. It was not possible for me to procure any accurate information respecting the private intrigues which were carried on in the Diet; though I endeavoured to get intelligence from some of the most conspicuous members. In this country it was believed that the succession to the throne was put to open sale, and actually purchased by the two successful candidates. But this is denied by all Swedes, and is very unlikely to be true. That some of the leading members of the Diet were privately influenced by bribes, is a much more probable opinion; but an opinion, the accuracy of which there were no means of ascertaining. It is well known that the first election fell upon Prince Augustenburg of Denmark; that he immediately proceeded to Sweden, and speedily became very popular with all ranks.

A resolution was passed by the States, that the annual sum of 15000*l.* was required for the decent maintenance of Gustavus and his family. His own private property was found to be equivalent to 9000*l.* a year. The remaining 6000*l.* was contributed by the state. It was divided into three parts, one of which was assigned to the King, another to

the Queen, during their lives, and the third to the children, so long as any of them should remain alive. Gustavus remained the whole summer at Gripsholm, and though he frequently expressed a strong desire to leave the kingdom, the request could not be complied with, till an answer was returned by the French Emperor to the application of Charles XIII. to allow Gustavus to retire into Switzerland. At length this application was complied with; the King and Queen left Gripsholm on the 6th of December, 1809, and the children some days later. His subsequent visit to Petersburgh and to England, and his speedy departure from this country, are known to all my readers.

The next business of the Diet was to prepare a new constitution for Sweden. I was informed by Mr. Jerta, who was at that time Secretary of State, and a man of consummate abilities, that the object of all parties was to assimilate the Swedish constitution as much as possible to that of Great Britain; and he seemed to conceive that this had been in a great measure accomplished. But from the very nature of the Swedish Diet, and from the want of a numerous middle rank, such an assimilation was in fact impossible. Sweden must be either an aristocracy or a simple monarchy, and from the tendency which the nobility have constantly shown to abuse their power, and tyrannize over their inferiors, it must be the interest as well as inclination of the common people to throw the power into the hands of the King. Hence a King of abilities has never found any difficulty in Sweden of seizing the whole power into his own hands; while during the reigns of weak princes the aristocracy as constantly recovered their importance. To assimilate the Swedish constitution to the British it would be necessary, in the first place, to alter all the laws respecting the nobility. The title should be confined to the eldest son, and the laws respecting taxation should reach the nobility as well as the common people. The country gentlemen should send representatives to the Diet, and by uniting with the burghers in one house they ought to form a body capable of balancing the power of the nobles, and possessing at least an equal share in the management of the state. While matters remain as they are, the nobles or the King are sure to have the management of the Diet. The Houses of the Clergy, Burgher-

and Peasants, except when they rally round the King, can have but very little weight. I shall here state the most striking features of the new Swedish constitution, as they are probably but little known in this country.

The government was declared to be monarchical and hereditary, with limitation to the issue male. A restriction obviously borrowed from the French, and betraying at the outset rather a partiality for the French than the British constitution, than which nothing can be more different from each other. The King must be of the true evangelical religion, and must govern conformably to the constitution, with and by the advice of a state council, the members of which were to be appointed by him, and responsible for their advice; he himself being exempt from all responsibility. This article is certainly an assimilation to the British constitution, so far as the responsibility of the King is concerned. The members must be natives of Sweden, and of the established religion. They are to consist of the two Ministers of State for judicial and foreign affairs, the Chancellor of the Court, and six Counsellors, three at least of whom must be civil officers. The Secretaries of State are to have a seat in the council whenever any case belonging to their respective departments comes under consideration. Neither a father and son, nor two brothers, can be members of the council at the same time. There are four Secretaries of State, one for each of the foreign, home, financial, and ecclesiastical departments. All the affairs of government, except the diplomatic or foreign relations, and the immediate command of the army and navy, are to be submitted to the consideration and decision of the King, assisted by at least three members of the council, besides the acting Secretary. Minutes are to be made of all the proceedings. Every member present is bound to give his advice; but the privilege of deciding is vested in the King, who may determine in virtue of his prerogative in opposition to the votes or opinions of all the council. If the King's decision be repugnant to the constitution and the laws, every member of the council is bound to remonstrate; and if any member's opinion is not duly recorded, that member shall be considered as guilty of counselling and abetting the King in his unconstitutional decision. This article

again savours strongly of France. It renders the responsibility of the council quite nugatory, and the constitution itself of no value whatever before a prince of abilities and address, who may thus render himself legally as absolute as he pleases.

The King may conclude treaties, after consulting the Minister for Foreign Affairs and the Chancellor. He may declare war or conclude peace; but before he do either, he must state his reasons to the council; the members of which are bound to give their opinion, and are responsible for it. The supreme command of the army and navy is vested in the King, and the ultimate decision in all matters relative thereto, assisted by the Ministers of State for this service, who are responsible for their advice. Diplomatic, civil, and military employments are at the King's appointment, who likewise appoints the archbishops and bishops; but he cannot remove a judge from his office, except for just cause, and on proof of criminality. Neither can he deprive, or cause any subject to be deprived of his life, liberty, honour, or property, without trial and judgment. Neither can he harass or persecute any person for his religious opinions, provided the promulgation of these opinions, or the exercise of that religion, be not injurious to the community.

The Council of Justice consists of six nobles and six commoners, who are to decide in judicial affairs. The King has a double vote, and may pardon criminals and mitigate or commute punishment. The King is not at liberty to quit the kingdom without consulting the State Council, and this council is to govern in his absence. The Prince or King is of age at twenty-one, but from the age of eighteen he is to attend the several Courts of Justice, though without taking any part in their decisions. When the successor is not of age, the diet is to be assembled in order to appoint a Regency during the minority. When the King leaves no heirs, the Diet is to assemble and choose a successor. The States are to assemble every fifth year at Stockholm. The bank is under their immediate controul, and the King can impose no taxes without the consent of the Diet. No Diet is to continue longer than three months, unless business require it. No officer of the

crown can influence the election of any of its members. No member can be accused or deprived of his liberty for his actions or expressions in his respective state, unless the particular state to which he belongs should demand it. At each Diet a Committee must be appointed for inquiring into the conduct of the Ministers, Council, and Secretaries of State. The restrictions on the press were removed, and a Committee appointed to superintend the liberty of the press.

These are the only particulars, as far as I could learn, in which the new constitution differs from that of 1772. As that constitution has been given at full length by Coxe, in *his Travels through Sweden*, and in several other English books, I take it for granted that it is too generally known to require any detail here. Some attempts were made by the peasants to confine the ranks of nobility to the eldest son of every family, and to extend the taxes over the estates of noblemen as well as commoners; but their attempts, being opposed by the whole body of the nobility, who had been the actors in the revolution, and who of consequence were at that moment more powerful than ever, produced no salutary effects.

It is well known that Prince Augustenburg did not long survive his election to the dignity of Crown Prince of Sweden. A disorder in his bowels carried him off during the course of the year 1811. The circumstances of his death occasioned a suspicion that he had been poisoned, and Count Fersen and his sister were, from some circumstances, suspected as the perpetrators of the crime. The populace upon this news became apprehensive of another revolution, and were in consequence roused almost to frenzy. When Count Fersen appeared in the streets of Stockholm, he was immediately surrounded by a crowd of people, and speedily cudgelled to death by blows with umbrellas, the only weapons with which they were provided. The actors in this disgraceful tumult were supposed to have been of a rank somewhat higher than that of the common people. But no inquiry was ever made: a proof of the unsettled state of Sweden, and the feeble power possessed by the new government. It was afterwards

ascertained to the conviction of every body, not only that the Count was innocent, but that Prince Augustenburg had not been poisoned, but had died in consequence of a natural disease.

A new Crown Prince was to be elected, and various candidates offered themselves. It is universally known that the choice fell upon Bernadotte, Prince of Ponté Corvo, who at that time had the command of a French army in the north of Germany, and who had begun his career as a private soldier in the French army. By what secret springs this election was conducted it was quite impossible to learn. But the nature of the choice, and the war with Great Britain, lead one strongly to suspect the all-powerful application of French influence. The Swedes all vehemently deny the existence of any such influence, and affirm that the election of Bernadotte was very much contrary to Bonaparte's wishes. But I do not believe that any one of those persons, with whom I conversed on the subject, had any means of acquiring accurate information. The secret means employed were probably known only to a very small number of individuals, and Bernadotte's consummate prudence, for which he is very remarkable, will probably bury the real truth for ever in oblivion, unless some unforeseen change in the affairs of Europe should make it his interest to divulge the secret.

There can be no doubt that Bernadotte was very popular both in Hanover, and at Hamburgh, and that his behaviour to the Swedes, when he was applied to about concluding a peace with the French Emperor, had made a powerful impression in his favour. His great abilities were generally known, and Sweden stood greatly in need of a Prince of abilities to raise her from the state of extreme feebleness into which she had fallen. It is affirmed in Sweden, that a coolness had for some time existed between Bonaparte and the Prince of Ponté Corvo, in consequence of Bonaparte, upon some occasion or other, throwing up to him his original rank of a private soldier. Such a story is well suited to the impetuous rudeness which characterizes Bonaparte; but it does not agree with the mild temper and consummate prudence of Bernadotte. To judge from appearances, he has not a good opinion of his own countrymen, for not a single Frenchman is em-

ployed either in the Swedish army or in any other situation, and all the applications which have been made to him by Frenchmen have been uniformly refused. It was he that brought about a peace between Great Britain and Sweden. The French Emperor was hurt at his conduct, and in consequence took possession of Swedish Pomerania. When the Russian war began last summer with France, he went over to Obo, had a conference with the Emperor of Russia, and it is confidently asserted that he planned the campaign which proved ultimately so successful to Russia and so disastrous to France. Yet all this while he has most carefully abstained from issuing any declaration, or involving Sweden in any active part against France. If Bonaparte prove ultimately successful, there can be little doubt that his conduct will admit of apology with Bonaparte, in consequence of the difficulty of his situation: while, on the other hand, if Britain and Russia prevail, he has gone far enough to secure the friendship of these two powers. Nothing therefore can be more skilful than the conduct which he has pursued. Indeed it may be questioned whether any other would not in the present circumstances have endangered his own situation, or the very existence of Sweden as a nation. Nothing would have been easier for him than to have induced Sweden to enter into an alliance with France. The Swedish nobility have all had a French education, and they have adopted a good deal of the manners and opinions of that volatile and unprincipled nation. The Swedes have been so long accustomed to an alliance with France, that it has become in some measure natural to the nation. They have imbibed the opinions, which Bonaparte has divulged with so much industry, respecting the danger of Great Britain holding the dominion of the sea, and the injury which British commerce and British manufactures do to other nations. These opinions I admit to be inconsistent with the knowledge of the first principles of commerce and even of common sense, and show a most miserable ignorance of the real interests and real state of Europe. Yet I have heard them gravely maintained by some of the most sensible men in Sweden. If to all this we add the severe treatment which they have met with from the Russians, and the

natural jealousy which every nation must have of a powerful and encroaching neighbour, we shall not be surprized that the great body of the Swedes in the present war take the part of the French, and are secretly hostile to Britain and Russia. When I was at Stockholm this appeared very strongly marked. When any news arrived of successes gained by the Russians, the faces of every one you met indicated diappointment and uneasiness. When news arrived of successes gained by the French, every person was in ectasy. I except from this the German and British merchants who reside in Sweden, and who constitute a small but respectable and wealthy body.

But had Bernadotte induced the Swedes to unite with France, the infallible consequence would have been, supposing Russia capable of standing her ground, that he would have been attacked by Great Britain and Russia, two powers that could with the utmost ease have divided and conquered the whole kingdom. On the other hand, had he united with Russia and declared war against France, the consequence would have been, supposing Bonaparte successful, that he would have been driven from the Swedish throne, and reduced again to a private station. We must admit therefore that no part of the conduct of Bernadotte has hitherto laid open his real intentions; if he has any other intentions than to preserve his situation, and be regulated in his alliances by circumstances.

As soon as Bernadotte was elected Crown Prince of Sweden, some of the Swedish Bishops went over to Denmark, and made him sign a renunciation of the Roman Catholic religion, and an acknowledgement that he had embraced the Lutheran tenets. At the same time he was baptized by the name of Charles John (*Carl Johan*). When he landed in Sweden he was met by a nobleman sent by the Diet to receive him. As soon as they met they embraced. By some accident the two stars with which they were decorated caught hold of each other, so that when they attempted to separate, they found themselves entangled. "Monseigneur," said the Nobleman, "nous nous sommes attaché." "J'espere," answered the Crown Prince without hesitation, "qu'il est pour jamais." Soon after his arrival in Sweden, he sent his

wife and his whole family out of the country, except his eldest son, Prince Oscar, a boy about fourteen years of age. It is well known that at present the rest of his family is in France. This step occasioned a good deal of speculation in Sweden, and much anxiety to know the reason of a conduct apparently so unnatural. A nobleman one day said to him, that the Swedes had always been accustomed to hear a great deal concerning the Royal Family; that they would of course be very inquisitive about his family, and on that account he wanted to know from his Royal Highness what answer he should give if any person asked him about the family of the Crown Prince: "In that case," replied Bernadotte, "you may say that you know nothing of the matter."

The Crown Prince seems in fact to be really the King of Sweden. Charles XIII. never appears in public, and he is so old and infirm that he is not probably able to manage the affairs of the kingdom, were he even so inclined. The first care of the Crown Prince was to restore the army which had been destroyed during the unfortunate wars of the late King, and to bring it again to a state of respectability. The French mode of levying troops by conscription, which the late King had in vain attempted to introduce, was resorted to. The Swedish army at present amounts to 50,000 men, besides the supplimentary troops, who may be 30,000 more; but are chiefly boys or young men under twenty. All the troops are dressed in French uniform, and the French tactics have been introduced into all the regiments. I saw a review of about 6000 Swedish troops. The orders were given by the Crown Prince himself, and the skill of the troops and the rapidity of their movements seemed to me to be very great. Every Swedish soldier has a house and a piece of ground assigned to him, by the cultivation of which he supports himself when not in the field. When called out he is supported by government. By this contrivance the Swedish army costs the country much less than it otherwise would do. The men are kept from vice, and their health and hardihood is probably promoted. When they are collected for drill, the first thing they do every morn-

ing on assembling is to sing a hymn. This practice they follow likewise when they go into action. It is said to have originated with Gustavus Adolphus.

The Crown Prince seems to be very popular in Sweden, every body spoke well of him. When he passed by the ranks of the Swedish troops, he was received with loud huzzas. He is a middle aged man, with a very dark complexion, an agreeable expressive countenance; but a little disfigured by the size of his nose. He cannot express himself intelligibly in Swedish. The person who has the charge of his horses is an Englishman, who has been with him these eight years.

# CHAPTER VIII.

## JOURNEY TO UPSALA.

Travel to Upsala—Geological Account of Upland—Road between Stockholm and Upsala—Description of Upsala—Palace—Cathedral—Tomb of Gustavus Vasa—Of John III.—Of Catharine Jaghellon—Of the Three Stures—Curiosities in the Sacristy—Mr. Törner—University—List of Professors and other Teachers—Progress of the Swedes in Botany, Mineralogy, and Chemistry.

THE subjects treated of in the last two chapters constitute a kind of digression from the main object of this work. But they comprehend a series of events so recent, so important, and so inaccurately understood in Great Britain, that I conceived it would have been improper in me to omit them. I now return to the journal of my travels.

On Wednesday, the 9th of September, we left Stockholm about five in the evening, and travelled till we reached Upsala, which is seven Swedish miles, or 46$\frac{2}{3}$ English miles, north from Stockholm. We had hired a Swedish servant, who had gone to England with the British ambassador, and spoke our language tolerably well. We paid him at the rate of six shillings sterling a day, besides victuals. He had been hired upon the recommendation of a German boy, without any particular inquiry, and turned out rather stupid, and so timid that he was quite unfit for travelling among mines, at all which he entertained the greatest aversion. I visited Upsala no less than three times, and travelled between that city and Stockholm both during the day and du-

ring the night. But I shall throw all my observations together in this place, both for the sake of brevity and distinctness.

The province of Upland in which Upsala lies, extends from the lake Mälar, on the South to the mouth of the river Dal on the North, and consists of all the country contained between the sea on the east side, and an imaginary line situated about six English miles west of Upsala, and drawn from the lake Mälar to the river Dal. The country is in general very flat, with round backed knolls or hills of small height rising here and there. These are more numerous on the northern and eastern sides of the province: like all the other provinces of Sweden it abounds in lakes, and is much covered with pine forests. The soil seems in general good, and as far as I observed it, consisted of clay. Marl, I was told, is frequently found at a depth of two or three feet. The country round Upsala is well cultivated, and must produce a considerable quantity of corn.

The rocks are all primitive; but exhibit a greater variety than most of the other Swedish provinces. In the neighbourhood of Stockholm they consist of gneiss, in some places very deficient in felspar, in others containing abundance of hornblende, and putting on the aspect of sienite; and in some few spots I observed a slight approximation to mica slate. The opinion I formed of these rocks from the most careful survey I could make was that they were gneiss, with occasional beds of quartz, hornblende and felspar interspersed. I thought I perceived likewise one bed of primitive greenstone in the southern suburbs of Stockholm; but was prevented by the buildings, which covered it on all sides, from making any accurate investigation. These gneiss rocks owing chiefly to deficiency of felspar, have not that red appearance which distinguish them in other parts of Sweden. The Swedes call such gneiss rocks *gray granite*, while to the gneiss that abounds in felspar they give the name of *red granite*. Under these names they will be found described in all Swedish books, even the latest that have been published.

In the northern parts of the province, as for example, in the neighbourhood of Dannemora, red coloured gneiss, or gneiss contain-

ing the usual proportion of the felspar appears. In the same part of the province I observed a single bed of mica slate, which I mention on account of its great scarcity in Sweden, at least in those provinces which I visited. I saw also beds of hornblende slate. This I conceive to be the rock which the Swedes call *compact horblende*, and which Cronstedt included under his name *trap*. In the same part of the province were beds of primitive lime. In short the whole of Upland may be conceived as consisting of gneiss, containing here and there beds of hornblende, greenstone, mica slate, lime, &c. not to mention the various mineral deposites, some of which I shall describe afterwards.

There is no town and hardly even a village between Stockholm and Upsala. But the road seems to be well frequented; and though it possesses all the beauty and goodness of the Swedish roads in general, yet it bears marks of a much more frequent communication between Stockholm and Upsala, than had been apparent in the road between Gottenburg and Stockholm. This is rather a curious circumstance and not easily accounted for.

We reached Upsala about two in the morning, and got lodgings in the Post-house, a ruinous building at the entrance of the city. The night was cold, and our bed clothes very scanty. The consequence was that we never got warm in our beds, were unable to sleep, and were in consequence exceedingly impatient for the appearance of morning.

Upsala is one of the most ancient cities in Sweden. It was long the capital of the kingdom: even before the introduction of christianity it was a place of note, and the residence of the High Priest of Odin. The present city stands a little to the south of *Gamla Upsala*, or Old Upsala, nothing of which now remains, except some rude monuments which are said to be tombs of the ancient Swedish Kings. It is conceived that the ancient city had been destroyed by fire, to which all wooden towns are extremely liable, and that the present city of Upsala, which is better situated, rose upon its ruins. About a Swedish mile from Upsala there is a place called *Mora Stenar* (pro-

bably *black stones*) where the ancient kings of Sweden were elected, and received the homage of their subjects. Nothing else is to be seen but a number of black stones (seemingly sienite and greenstone), covered with figures, and Runic inscriptions, collected into a small house near the meadow where they formerly stood.

When we got up in the morning, the first objects that struck us were the palace, situated upon a rising ground, on the south side of Upsala, and the cathedral within the town. These were the most striking objects; the one, from its size and situation, the other, from its magnificence. The palace at Upsala was begun by Gustavus Vasa, and finished by his son Eric XIV. In the year 1702 it was burnt down, and only one wing and part of another at present remain. In this palace the Governor of the province usually resides. Here the dungeon is shown in which Steno Sture was confined by Eric XIV., and some rude letters are still seen on the wall which he is said to have cut in the estasy of his grief, when he was informed of the murder of his son.

The cathedral of Upsala is a very large brick building, completely Gothic within; but without, there are two towers of a later date than the rest of the building, adorned with Doric pillars, which injure a good deal the symmetry of the whole. It must be allowed however to be the finest as well as the largest cathedral in Sweden. The interior is particularly fine: perhaps it owes not a little of the interest which we take in surveying it to the monuments of the different celebrated men and heroes which it contains. Upsala is perhaps the most ancient Christian establishment in Sweden. The first Bishop was an Englishman, named Everinus, who came over in the year 1026 at the request of Olaus Scotkonung, to assist in converting the natives of Upsala to Christianity; the similarity of the English and Swedish languages was the motive of this request, and induced not only Everinus, but several others of his countrymen, to attempt the conversion of the Swedes: their endeavours, conducted with great moderation and address, were eminently successful. The successors of Everinus resided chiefly at Sigtuna till the year 1120, when Nicholas Ulphson fixed his residence

at Old Upsala. Stephen, a native of East Gothland, was raised to the dignity of Archbishop in the year 1164, and was the first Archbishop that Sweden had possessed. Falco, who was consecrated in 1267, transferred his residence to New Upsala, in consequence of the destruction of the old cathedral by fire, in the year 1246. The present cathedral was built in the 13th century, under the direction of Stephen Bonneville, a French architect, and was designed after the model of the church of Notre Dame, at Paris.

The inside of the cathedral is striking: like all other Swedish churches which I have seen, it was very clean and kept in excellent order: a double row of fourteen fluted pillars runs from one end to the other: the organ is the largest in Sweden: the altar is very magnificently decorated. Above it there is an image of our Saviour on the cross, and two Scripture pieces, one on each side. Round the inside are various cemeteries, some of them magnificent. The one to which I was naturally led in the first place, from my previous knowledge of his history, and my high admiration of his heroism and exalted character, was that of Gustavus Vasa, the deliverer of his country and founder of the dynasty which still continues to occupy the throne: a dynasty remarkable for containing a greater number of princes of ability than any other dynasty in Europe. But the splendid qualities which they possessed (if we except Gustavus Vasa and Charles XI.,) served only to injure their country, by exhausting its resources and plunging it into greater misfortunes than it would otherwise have been exposed to. Perhaps the greatest misfortune to a country is to possess a prince of abilities according to the common acceptation of the word, because it almost uniformly leads him to pursue a line of conduct that is inconsistent with the true interests of his country.

The monument of Gustavus Vasa stands in a private chapel, and is an oblong monument of marble, with pyramids at each angle. His figure is represented in marble between the figures of his two first wives, who were buried in the same tomb. This monument is a good deal injured by a fire, which formerly laid waste the cathedral of Upsala. One of the pyramids has fallen down, and the statues themselves are

mutilated, particularly those of his queens. Upon the tomb is engraved a genealogical table, tracing his pedigree to the ancient princes of the north. Such a pedigree was not worth transcribing, and was quite unnecessary to enhance the merit of Gustavus Vasa, who was one of the greatest and best kings that ever filled a throne.

Near the altar stands a silver coffin containing the bones of Eric XIV. the eldest son of Gustavus Vasa, who was esteemed a saint. The unfortunate history of this prince has been related in a former chapter of this work.

Another monument is that of John III. the second son of Gustavus Vasa, who deposed his brother, and afterwards poisoned him, and succeeded him as King of Sweden. He was a prince of the most winning affability of manners, and possessed uncommon skill in languages, and a very great stock of erudition. But he seems to have been a prince destitute of fixed principles, incapable of steadiness, and chiefly directed by the opinions of his wives. During his father's life-time he was a zealous Lutheran; but marrying a Roman Catholic lady, he became as keen a partizan of Catholicism, and attempted to introduce it again into Sweden at the hazard of a civil war. He was commanded by the Pope to fast one day every week as a penance for his brother's murder; a penance which it is said he constantly performed all his life long with the utmost punctuality. His first wife dying, he married a Lutheran lady. This change soon cooled his zeal for the Roman Catholic religion, and he became at last quite indifferent about religion altogether. His unwise conduct deprived him of the whole of his popularity, and the greatest part of his power. He left a feeble sceptre to his son Sigismond, King of Poland, which was soon wrested from his grasp by Charles IX., the fourth son of Gustavus Vasa, and father of Gustavus Adolphus.

There is a splendid monument of Catherine Jaghellon, Princess of Poland, and wife of John III. raised by her uxorious husband. She was a woman of great beauty; but being a Roman Catholic, and stirring up her husband to restore that religion in Sweden, she proved injurious to the country over which her husband reigned.

I viewed with considerable interest, and not a little emotion, the tomb of the three Stures, who fell a sacrifice to the madness and tyranny of Eric XIV. It was erected by the widow of Count Svante, and contains (besides some verses) an inscription in Latin prose to the following effect: "This is the burial place of the last remaining branch of the Stures, whose ancient and royal lineage was illustrated by Steno, Svante, and Steno, three successive regents of Sweden, deservedly styled, for their merits and virtues, Fathers of their country. But Svante, son of the last Steno, raised to the dignity of Count at the coronation of Eric XIV., and his sons, Nicholas and Eric, both eminent in peace and war, fell victims to a violent death on the 4th of May, 1566. All that was great and noble could not soothe the iron heart of their sovereign. Reader! if thou art not equally unfeeling, deplore the unmerited catastrophe of such exalted virtue."

The first Protestant archbishop of Upsala was Laurentius Petri, of the province of Nerike. He, in conjunction with his brother Olaus Petri, first preached the reformed doctrines to the Swedes, and translated the Bible into the Swedish language. Soon after the establishment of the Lutheran church in Sweden, which was in a great measure owing to his labours, he was consecrated archbishop, and died in 1570, in the 73d year of his age.

In the sacristy of the cathedral several articles are kept, which are worth seeing as curiosities. The archbishop's robes are there: they are very magnificent, but so heavy, that I should conceive it would be not a little cumbersome for an old man to wear them. They were presented to the archbishop of Upsala by Gustavus III. who is said to have brought them from Rome. The coat worn by Eric, the son of Steno Sture, when he was stabbed by Eric XIV. is preserved in the same place, and must be viewed with emotion by all who are acquainted with the virtues and the history of this unfortunate family. It is a brown coat without lining, exceedingly light, with metal buttons, and some slight ornaments of lace. It appears superfine. The place where the King stabbed Eric, and the blood which flowed from the wound, are both very visible.

Another curiosity, but of which one cannot make so much, is a ragged piece of linen fixed to a staff, like a pair of colours, and called the shirt of Margaret. It was carried in battle as the main standard to animate the troops with the recollection of her warlike virtue. This relic was deposited in Nuremberg, from which it was brought by the Swedes and placed in Upsala, as a kind of memorial of this heroine of the north. I was shown also an enormous whetstone, which I was told had been sent to Margaret by Albert, King of Sweden, recommending her to sharpen her own sword, and those of her followers, before she ventured to make an attack upon him. This taunt was speedily followed by the defeat of Albert and his capture by Margaret. Lastly, I was shown a miserable representation of a human head, not better than those brought now-a-days from the South Sea islands. This is said to be an image of the god Thor, who was very much the object of worship in that part of Sweden before the introduction of the Christian religion. Human sacrifices were offered up to this deity at Upsala.

Upsala is a small but very regular and neat looking town. It has a square in its centre, and all the streets terminate in this square, and the principal streets are either parallel to each other, or they cross each other at right angles. It takes its name from the small river Sala, which runs through it. This river has diminished very sensibly within the memory of man, and fears are entertained that it will speedily become too small to drive a mill, situated within the town, and upon which a considerable part of the revenues of the university depend. The number of inhabitants in Upsala are about 3000, exclusive of students, who may amount to 500 more. In the tables of the population of Sweden, published in the Memoirs of the Swedish Academy of Sciences, the inhabitants of Upsala are reckoned 4897. But something more than the mere town of Upsala, and the students are included. This city has no species of trade or manufacture whatever, but depends entirely upon the university.

Soon after our arrival in Upsala, we were visited by a Mr. Törner, who had been for four years under-librarian to Sir Joseph Banks in

London, and who of consequence spoke English very well. To his attention I was indebted for almost every thing I saw in Upsala. He is under-librarian to the university, and is in the habit of teaching English to such of the students as wish to learn that language. By that means he contrives, as he informed me, to make a very comfortable livelihood.

But the great object of curiosity in Upsala is the University, which is not only the oldest but deservedly the most celebrated in Sweden. It was founded by Steno Sture, in the year 1478, and the regulations were made conformably to those of the University of Paris, at that time the most celebrated school in Europe. The institution was confirmed by a decree of the Diet, and the University was opened with great ceremony on the 7th of October in that year. Gustavus Vasa warmly patronized it, and conferred on it many new privileges. John III. carried it to Stockholm, but it was again restored to Upsala by Charles IX. During the reign of this prince it declined considerably, but revived again with increased lustre during the time of his son and successor Gustavus Adolphus. He constructed a building for the University at his own expense, and endowed it with his patrimonial estate of Vasa, by means of which the salaries of the professors were augmented, and 150 students maintained. Part of the library is owing to this munificent prince. Several of his successors imitated his illustrious example in protecting and encouraging this University.

At the head of the University is the Chancellor, always a person of rank, elected by the professors, and confirmed by the King. He regulates and explains the statutes, composes all material differences, and delivers petitions and messages from the University to the King. When absent, his office is supplied by the Archbishop of Upsala. The presidency devolves by rotation on one of the professors, who is styled *Rector Magnificus.* He is a kind of Justice of Peace, can punish the students for small delinquencies, and settles such differences as are too trifling to be laid before the Consistory.

The University has its own Court of Justice, called *Consistorium Minus,* for the trial of the students and dependents. It is composed of a

certain number of professors, and judges of misdemeanors according to the common law. An appeal lies from its decision to a *Consistorium Majus*, which is formed of all the professors. From them an appeal likewise lies to the Provincial Court of Justice. The salaries of the professors do not exceed 100*l.* a year. They deliver their public lectures gratis, and of course pay but little attention to them. But they teach privately likewise, and receive fees from all the students that attend these private and most valuable courses. By all accounts their audiences are very small. Forty or fifty being reckoned an extraordinary class. Indeed, by all that I could learn, the number of students has been rather on the decline, and no foreigners seem ever to attend it. The only person at Upsala to whom that name applied, as far as I could learn, was a Finlander, who was a *Magister docens*, and of course had begun his attendance at the University before Finland was separated from Sweden.

The students repair to the University at the age of sixteen. They lodge in the town in private houses, wear no distinguishing dress, and are subjected to no peculiar academic discipline; unless an institution similar to one that exists in the University of St. Andrews, in Scotland, be entitled to that name. The students are divided into classes according to the provinces to which they belong. Each class has a professor at its head, called *Inspector*, and two sub-directors, styled *Curatores*: the members of the class are divided into *Juniores* and *Seniores*, the latter of whom in some measure regulate the conduct of the former. Each class assembles separately at least six times a year at the house of the *Inspector*, and oftener if it be necessary. At these meetings the *Juniores* perform certain exercises, which are necessary before they can be raised to the rank of *Seniores*. The students usually dine at eating-houses, where they are in the habit of running monthly accounts. There are two rival houses of this description, each patronized by certain professors. Neither of them are distinguished by any particular sign. I dined at both of these houses, and found the dinner comfortable, and the charge reasonable. I was surprised to find that many of

the professors likewise dined at these houses; not indeed at the same table with the students, but in a room by themselves. The time when the professors begin their lectures is the first of October, and the session lasts about eight months.

The common degrees granted by the University of Upsala are *Philosophiæ Candidatus*, or Bachelor of Arts; and *Philosophiæ Magister*, or Master of Arts. The degrees in divinity, law, and medicine are three, and are styled *Theologiæ, &c. Candidatus, Licenciatus, Doctor.* When the students take their *master's degree* they appear in a black silk cloak. On days of ceremony the professors are clad in black cloaks. On the same occasions the doctors in divinity are distinguished by a black silk hat, the doctors of law by a white silk hat, and the doctors of medicine by a hat of green or sky-blue silk.

The teachers at Upsala may be divided into four distinct classes; namely, professors, assistants, magistri docentes or privileged teachers, and a set of persons who teach horsemanship, dancing, painting, music, and certain modern languages. The best way of conveying a clear idea to the reader of the different branches taught at the University of Upsala will be to give a list of the different teachers as they existed when I was in that city in 1812, divided according to their different ranks and departments:

CHANCELLOR. The Crown Prince of Sweden.
SUB-CHANCELLOR. James Lindblom, Archbishop of Upsala.

## I. PROFESSORS.

### 1. OF THEOLOGY.

1. John Winbom, S. T. D. Head Professor of Theology, and Archdeacon of Upsala.
2. Samuel Ödmann, S. T. D. Professor of Pastoral Theology.
3. Levinus Olbers, S. T. D. Professor of Theology.
4. Andrew Hulten, S. T. D. Regius Professor of Theology.

*Extraordinary.*

5. Eric Abraham Almquist, S. T. D. Regius Professor, Assessor of the Theological Faculty and Ordinary Adjunct.

2. OF LAW.

6. John Daniel Drissel, Phil. et J. U. D. Professor of Swedish and Roman Law.

7. Laurence George Rabenius, Ph. et J. U. D. Professor of Jurisprudence and Œconomics.

3. OF MEDICINE.

8. Charles Peter Thunberg, M. D. Knight of the Order of Vasa, Professor of Medicine and Botany.

9. Peter Afzelius, M. D. Surgeon General, Knight of the Polar Star, Professor of the Theory and Practice of Medicine, and Physician to the Hospital of Upsala.

10. James Äkerman, M. D. Professor of Anatomy and Surgery.

4. OF PHILOSOPHY.

11. Eric Michael Fant, S. T. D. Professor of History.

12. John Afzelius, Knight of the Order of Vasa, Professor of Chemistry.

13. Peter Fabian Aurivillius, Librarian, and Professor of Humanity.

14. Zacharias Nordmark, Knight of the Polar Star, Professor of Natural Philosophy.

15. Professor of Eloquence and Poetry. This chair was vacant in consequence of the resignation of Eric Götlin, who had filled it.

16. Samuel Liljeblad, Ph. et M. D. Professor of Practical Œconomy.

17. Andrew Svanborg, Professor of the Oriental Languages.

18. Olaus Kolmodin, Professor of Eloquence and Politics.

19. Professorship of Logic and Metaphysics, vacant in consequence of the death of Benjamin Charles Henry Höijer, the former professor.

20. Gustavus Knös, Professor of Greek.

21. Jöns Svanberg, Professor of Mathematics.

22. Nicolaus Frederick Biberg, Professor of Ethics and Politics.
23. John Bredman, Professor of Astronomy.

## II. ASSISTANTS.

### 1. IN THE THEOLOGICAL FACULTY.

1. Eric Bergström, S. T. Candidatus et Adjunctus.
2. George Frederick Fant, S. T. C.

*Extraordinary.*

3. Sveno Lundblad, S. T. L. et Adjunctus.

### 2. IN THE FACULTY OF LAW.

4. Andrew Eric Afzelius, Ph. et J. D. Assistant to the Professor of Swedish and Roman Law.
5. Sveno Themptander, Ph. et J. D. Assistant to the Professor of Jurisprudence and Œconomics.

### 3. IN THE FACULTY OF MEDICINE.

6. Adam Afzelius, Ph. et M. D. Demonstrator of Botany.
7. Charles Zetterström, M. D. Adjunct to the Faculty of Medicine.
8. Henry William Romanson, M. D. Demonstrator in Anatomy, and Surgeon to the Hospital.

### 4. IN THE FACULTY OF PHILOSOPHY.

9. Olav Gustaf Schilling, Practical Astronomer.
10. Andrew Gustaf Ekeberg, Adjunct and Operator in Chemistry.
11. Severin Lövenhjelm, Adjunct to the Professor of Practical Œconomy.
12. James Borelius, Adjunct of Theoretical and Practical Philosophy.

The Adjuncts of Greek, Humanity, Mathematics, and Natural Philosophy were vacant.

*Extraordinary Adjuncts.*

13. Elias Christopher Grenander, Extraordinary Adjunct of Philosophy.

14. John Traner Extraordinary Adjunct in Humanity.

15. James Michael Svedelius, Extraordinary Adjunct of Humanity.

16. Charles John Lundvall, Extraordinary Adjunct of Humanity.

17. Jonas Jonæ Brändström, Extraordinary Adjunct of Mathematics and Natural Philosophy.

## III. MAGISTRI DOCENTES.

### 1. IN THE THEOLOGICAL FACULTY.

1. Nicolaus Kellström.

2. John Thorsander.

3. John Bodin.

### 2. IN THE FACULTY OF LAW.

4. Daniel Myreen, J. U. D. Teacher of the Swedish and Roman Law.

5. Charles John Haggren, J. U. D. Teacher of Œconomical Jurisprudence and Commerce.

### 3. IN THE FACULTY OF PHILOSOPHY.

6. James Edfelt, Teacher of Humanity.

7. Samuel Grubble, Teacher of Theoretic Philosophy.

8. Jonas Kjellander, Teacher of Politics.

9. Gustaf Vinberg, Teacher of the History of Sweden.

10. Peter Sjöbring, Teacher of Hebrew and Arabic.

11. Peter Svedelius, Teacher of Greek.

12. John Peter Fröberg, Teacher of Theoretical Physics.

13. Laurence Peter Walmstedt, Teacher of Elementary Mathematics.

14. Joseph Otto Höijer, Teacher of Roman Literature.

15. Eric Gustaf Geyer, Teacher of Universal History.

16. John Olav Holmström, teacher of the Latin Language.
17. Sveno Frederick Lidman, teacher of Arabic Literature.

## IV. MASTERS OF THE EQUESTRIAN AND POLITE ARTS.

1. Olav Malmerfeld, Riding Master.
2. Israel Strömberg, German Master.
3. Charles Christopher Porath, Fencing Master.
4. Olav Eric Roselius, Drawing Master.
5. John Christian Frederick Hæffner, Music Master.
6. Maximilian de Bethune, French Master.
7. Dancing Master, vacant.

Such are the names and professions of the respective teachers in Upsala. The assistant professors and magistri docentes are usually exceedingly poor. Nor do I conceive that the circumstances of all the professors are good; for most of them are unmarried, a proof that they do not consider themselves in circumstances which will enable them to support a family. Some however, Thunberg, for example, professor of botany, are rich. As the designations of the professors do not always indicate what they really teach, and as they frequently vary their subjects, the best way to give the reader a distinct idea of what is usually taught at Upsala, will be to insert a table of the things taught by each person during the course of one year: at the beginning of every session such a table is always published, under the title of *Catalogus Prelectionum in Academiâ Regiâ Upsaliensi publice et privatim a die primo Octobris Ann.* —— *ad idem tempus anni sequentis instituendarum.* That is, a list of the public and private lectures to be delivered in the Royal University of Upsala, from the first of October of the year —— to the same day of the following year. I shall print in a note below the list for the year 1811.*

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* PROFESSORES

THEOLOGI

JOHANNES WINBOM, S. THEOL. DOCT. PRIMARIUS THEOL. PROFESSOR ET ARCHIPRÆPOSITUS UPSALIENSIS, REGII ORDINIS DE STELLA POLARI MEMBRUM, diebus Lunæ

It is not to be supposed that a visit to Upsala for a few days should enable me to form any opinion of the merits of such a numerous class

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et Martis prælectiones Theologico-Exegeticas in Psalmos Davidis, Jovis vero et Veneris in Epistolas Paulinas, h. a. m. VIII. in Audit. Ecclesiastico publice instituet. Privatim desideriis Hon. Commilitonum satisfacere conabitur.

SAMUEL ÖDMANN, S. THEOL. DOCTOR, THEOLOGIÆ PASTORALIS PROFESSOR REG. ET ORD. ATQUE SEMINARII UPSALIENSIS DIRECTOR, REGII ORDINIS DE STELLA POLARI MEMBRUM, clementissimè sibi demandatam provinciam omni cura et fidelitate administrare studebit.

LEVINIUS OLBERS, S. THEOL. DOCTOR, THEOLOGIÆ PROFESSOR, REG. ET ORD. KALSEN. diebus Lunæ et Martis Prænotiones Theologicas, d. Jovis et Veneris Historiam Ecclesiasticam, in Audit. Eccles. h. a. m. XII. publicè tradet: Privatam quoque operam desideriis atque usui Hon. Commilitonum accommodare studebit.

ANDREAS HULTEN, S. THEOL. DOCTOR AC PROFESSOR REG. ET ORD. h. a. m. X. in Audit. Ecclesiastico Theologiam Dogmaticam et Moralem publicè tradet. Privatam operam desideriis Hon. Commilitonum accommodabit.

EXTRAORDINARIUS

ERICUS ABRAH. ALMQUIST, S. THEOL. DOCTOR, ATQUE PROFESSOR R. ET E. O. FACULTATIS THEOLOGICÆ ASSESSOR ET ADJUNCTUS ORDINARIUS, prælectiones publicas in Theologiam Symbolicam et Apologeticam, h. a. m. XI. in Auditorio Ecclesiastico continuabit. Privatim vero quodcunque Theologicarum scientiarum genus præcipuum delegerint Hon. Commilitones, sedulo explicare studebit.

## JURISCONSULTI

JOHANNES DANIEL DRISSEL, PHIL. ET J. U. DOCT. JURIS PATRII ET ROMANI PROFESSOR REG. ET ORD. prælectiones publicas in Titulum de Jure agrario Semestri autumnali h. a. m. XI. domi suæ continuabit; Vernali Jurisprudentiam practicam proponet. Privatam operam usui ac desideriis Hon. Commilitonum accommodabit.

LAURENTIUS GEORG. RABENIUS, PH. ET JUR. UTR. DOCT. JURISPR. OECON. ET COMM. PROF. REG. ET ORD. ob alia elementissime sibi demandata negotia vacatione muneris utitur, partes ejus sustinente Consultissimo Doctore et Juris Adjuncto SV. THEMPTANDER.

## MEDICI

CAROLUS PETRUS THUNBERG, MED. DOCT. MEDIC. ET BOTANICES PROFESSOR R. O. REG. ORD. VASÆI EQUES, Lectiones Botanicas in Horto Academico, hora X. publicè habebit mensibus autumnalibus. Animalium deinde Historiam, Oeconomiam et usum explicare continuabit. Insequenti anno Botanicen, Deo volente, proponet.

PETRUS AFZELIUS, M. D. PH. ET CH. M. REI CHIRURGICÆ DIRECTOR SUPREMUS,

of men, who delivered their lectures in a language with which I was very imperfectly acquainted. Nor indeed would it be decorous to ex-

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MEDICINÆ THEORETICÆ ET PRACTICÆ PROFESSOR R. ET O. ATQUE PRÆFECTUS NOSOCOMII ACADEMICI, REG. ORDINIS DE STELLA POLARI EQUES, REG. COLLEGII MEDICI MEMBRUM HONORARIUM, Morborum C. H. Cognitionem et Curam publicè h. XII. in Auditorio Medico, qua coepit Methodo, tradere perget. Ad lectos præterea ægrotantium, quos excipit Nosocomium Academicum, h. IX. matutina, de more, Medicinæ Studiosis, qui Praxi Clinica institui velint quotidie aderit.

JACOBUS ÄKERMAN, M. D. ANATOMIÆ ET CHIRURGIÆ PROFESSOR REG. ET ORD. Lectionibus publicis hora a. m. XI. Elementa Medicinæ Forensis explicabit in Auditorio Medico semestri autumnali, vernali vero Anatomiam et Physiologiam methodo, qua cœpit, in Theatro Anatomico tradet. De cetero tam in arte secandi, quam reliquis sui muneris partibus omnem operam offert.

## PHILOSOPHI

ERICUS MICHAËL FANT, S. THEOL. DOCTOR, HISTORIARUM PROFESSOR REG. ET ORD. CONSISTORII ECCLESIASTICI ASSESSOR, REGII ORDINIS DE STELLA POLARI MEMBRUM, Historiam Patriæ tradet publicis prælectionibus in Auditorio Gustaviano, hora XII. privatas desideriis honoratiss. Commilitonum accommodaturus.

JOHANNES ÄFZELIUS, CHEMIÆ PROFESSOR R. ET O. REG. ORDINIS VASÆI EQUES ET R. COLLEGII MED. MEMBRUM HONORARIUM, Theoriam Scientiæ in Auditorio Chemico publice, h. a. m. IX. Praxin in Laboratorio, diebus Mercurii et Saturni, edocere perget.

PETRUS FABIAN. AURIVILLIUS, ACADEMIÆ BIBLIOTHECARIUS ET LITTERARUM HUMANIORUM PROFESSOR R. ET O. Elegantioris Litteraturæ Præcepta et Fata, in Auditorio Gustaviano, h. p. m. II. publicè explicabit.

ZACHARIAS NORDMARK, PHYSICES PROFESSOR R. ET O. REG. ORD. DE STELLA POLARI EQUES, Physicen, atque eas præcipue hujus Scientiæ partes, qua Matheseos applicationem desiderant, in Auditorio Facultatis Philosophicæ h. a. m. traditurus est.

ERICUS GÖTLIN, ELOQUENTIÆ AC POESEOS PROFESSOR REG. ET ORDIN. ATQUE NUMOPHYLACII ACAD. PRÆFECTUS, in Audit. Gustaviano hora XI. publicè absolutis, quæ ex Cicerone de Amicitia et Virgilii Georgicis restant, diebus Lunæ et Martis Titi Livii Historiam Romanam, Jovis autem ac Veneris diebus P. Ovidii Metamorphoses interpretabitur; nec privatim desideriis Studiosæ Juventutis deerit.

SAMUEL LILJEBLAD, PHIL. ET M. D. OECONOMIÆ PRACTICÆ PROFESSOR R. ET O. BORGSTRÖMIANUS, Principia Oeconomiæ Ruralis in Auditorio Facultatis Juridicæ h. a. m. VIII. docebit, nec non privatam sui muneris operam pollicetur.

ANDREAS SVANBORG, LINGUARUM ORIENTALIUM PROFESSOR REG. ET ORD.

press any opinion on the subject. The University of Upsala has long been the most celebrated in the North of Europe, and has produced

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Codice S. Hebræo Carmen Hjobi in Auditorio Gustaviano h. a. m. IX. publice explicabit. Elementa Dialectorum Orientalium privatim tradet.

OLAVUS KOLMODIN, ELOQUENTIÆ ET POLITICES PROFESSOR R. ET O. SKYTTIANUS, lectionibus publicis in Audit. Facult. Philosophicæ h. a. m. IX. C. Cornelii Taciti Annales diebus Lunæ et Martis interpretabitur; Jovis Venerísque diebus Civitatum Europæarum præcipua fata statumque præsentem enarrabit, in ceteris sui muneris partibus privatiori opera Commilitonibus haud defuturus.

BENJAMIN CAROLUS HENR. HÖIJER, LOGICÆ ET METAPHYSICÆ PROFESSOR REG. ET ORD., deposito munere Rectoris, publicè Philosophiam Transcendentalem exponet h. a. m. X. in Auditorio Gustaviano; privatim Introductionem in Philosophiam præleget.

GUSTAVUS KNÖS, GRÆC. LITT. PROF. REG. ET ORD. hora XII. in Auditorio Facultatis Philosophicæ diebus Lunæ et Martis Disciplinam Cyri Xenophonteam, Jovis Veneríque diebus Carmen Odysseæ Homericum publice persequetur; privatim Hesiodum et Sophoclem tradet.

JÖNS SVANBERG, MATHEMATUM INFER. PROFESSOR REG. ET ORD., in Auditorio Astronomico hora a. m. IX. Theoriam Æquationum partesque Analyseos Mathematicæ Studiosis fideliter explicabit.

NICOLAUS FREDERICUS BIBERG, ETHICES ET POLITICES PROFESSOR REG. ET ORD., suscepto munere, publice hora a. m. VIII. in Auditorio Gustaviano Historiam Philosophiæ Moralis, privatim Principia Juris Civilis et Publici exponet.

JOHANNES BREDMAN, ASTRONOMIÆ PROFESSOR REG. ET ORD. Elementa Scientiæ Sideralis in Auditorio Astronomico h. a. m. XI. publice explicabit. Consilia quoque hujus Scientiæ Cultoribus privatim conferre, si qui eadem sibi profutura autumaverint, non intermittet.

## ADJUNCTI
## IN FACULTATE THEOLOGICA

ERICUS BERGSTRÖM, S. THEOL. CANDIDAT. ET ADJUNCTUS ORD. Exercitationes Catecheticas, in Auditorio Eccles. h. p. m. II. Seminario adscriptis instituet, Sacrum quoque illorum diligens formabit stilum et vocem.

GEORGIUS FREDERIC. FANT, S. THEOL. CANDIDAT. ET PRÆFECTUS SEMINARII, Muneris Sacri ad ritus et leges obeundi Præcepta in Audit. Eccles. hora a. m. IX. publicè tradet: Privatim vero in Exercitationibus Homileticis operam, quam debet fide et diligentia, S. M. Candidatis præstare conabitur.

### EXTRAORDINARIUS

SVENO LUNDBLAD, S. THEOL. LICENT. ET ADJUNCTUS E. O. in iis, quæ Theologiam,

some of the most eminent men of whom modern times can boast. The regulations of the University of Upsala are well calculated to keep up

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Exegesin Sacram in primis spectant, usui ac desiderio Commilitonum operam suam accomodare studebit.

## IN FACULTATE JURIDICA

ANDREAS ERICUS AFZELIUS, PH. ET J. U. DOCT. JURIS PATRII ET ROMANI ADJUNCTUS, SYNDICUS ACADEMIÆ, quamcumque præoptaverint H. C. Jurisprudentiæ Theoreticæ partem tractabit, Practicam insuper Jurium disciplinam per forenses exercitationes traditurus.

SVENO THEMPTANDER, PHIL. ET JUR. UTR. DOCT. JURISPR. OECON. ET COMM. ADJUNCTUS, Jurisprudentiam Oeconomicam, publicis lectionibus, in Auditorio Oeconomico hora XII. proponet; privatam operam ad desideria H. C. accommodaturus.

## IN FACULTATE MEDICA

ADAMUS AFZELIUS, PHIL. ET MED. DOCTOR, BOTANICES DEMONSTRATOR, Mensibus autumnalibus de Materia Medica, vernalibus autem de Elementis Historiæ Naturalis, cum ceteris, quæ sui sunt muneris, Studiosæ Juventuti, qua poterit perspicuitate et brevitate, tradere studebit.

CAROLUS ZETTERSTRÖM, M. D. ET FACULTATIS MEDICÆ ADJUNCTUS, quæ Medico Castrensi, nostrati, sunt cognitu maxime necessaria, ut superiori semestri incepit, Cultoribus medendi Scientiæ proponere perget, nec alia quacunque institutione atque consiliis illos adjuvare intermittet.

HENRICUS WILHELMUS ROMANSON, M. D. ANATOMIÆ PROSECTOR ET CHIRURGUS NOSOCOMII ACADEMICI, quæ suarum sunt partium, Elementa Anatomiæ artemque secàndi edocebit. Chirurgiæ denique militaris rudimenta, qua cœpit methodo, ad præscriptam ab Experientissima Facultate Medica normam accommodata, diebus horisque solitis, sedulo exponet.

## IN FACULTATE PHILOSOPHICA

OLAVUS GUST. SCHILLING, ASTRONOMIÆ OBSERVATOR, in Astronomicis, a se instituendis, Observationibus Phænomena Cœlestia Sideralis Scientiæ cupidis sedulo explicabit.

ANDREAS GUSTAVUS EKEBERG, CHEMIÆ ADJUNCTUS ET LABORATOR, in præceptis Chemiæ explorandis, quibus id genus doctrinæ placuerit, studium privatum et consilium pollicetur.

SEVERIN LÖWENHJELM, OECONOMIÆ PRACTICÆ ADJUNCTUS BORGSTRÖMIANUS, Honoratissimis Commilitonibus in primis Prætorum culturam exponere conabitur.

JACOBUS BORELIUS, PHILOSOPHIÆ THEORETICÆ ET PRACTICÆ ADJUNCTUS, et Phi-

this honourable pre-eminence so glorious to Sweden. The small income of the professors prevents them from being led from their duty by the

losophiam Moralem, et Jus Naturæ, prout suaserint studia Commilitonum, privatis lectionibus tradere perget.

Munera ADJUNCTORUM in LITTERATURA GRÆCA, in LITTERIS HUMANIORIBUS, atque in MATHESI ET PHILOSOPHIA NATURALI, vacant.

EXTRAORDINARII

ELIAS CHRISTOPH. GRENANDER, PHILOSOPHIÆ ADJUNCTUS EXTRAORD. per semestre Autumnale, dum Rectoris munere fungitur Logicæ et Metaphysicæ Professor, prælectiones publicas habendi officium obire jussus, ad ductum Tractatus Celeb. Prof. B. C. H. HÖIJER Constructionem Philosophicam exponet in Audit. Gustav. h. a. m. X. Privatim explicabit Jus Naturæ, vel alia, quæ in genere Philosophiæ præoptaverint Honor. Commilitones.

JOHANNES TRANÉR, LITTERARUM HUMANIORUM ADJUNCTUS EXTRAORDIN. suo in munere omnis erit.

JACOBUS MICH. SVEDELIUS, LITTERAR. HUMAN. ADJUNCTUS EXTRAORDIN. Historiam et Antiquitates Romanas, secundum Livium, explicabit, iis insuper adfuturus, qui in Stilo patrio vel latino formando suam operam non inutilem existimaverint.

CAROLUS JOH. LUNDVALL, LITTER. HUMAN. ADJUNCTUS EXTRAORD. ET AD R. GYMN. STREGNES. DESIGN. ELOQU. ET POES. LECTOR, Honoratissimis Commilitonibus, stilum præcipue Latinum formaturis, consilia sua et operam offert.

JONAS JONÆ BRÄNDSTRÖM, MATHESEOS ET PHILOSOPHIÆ NATURALIS ADJUNCTUS EXTRAORDINARIUS, in illo Matheseos evolvendo capite, quod potissimum elegerint singuli Mathematum cultores, operam pollicetur fidelem.

## MAGISTRI DOCENTES

## IN FACULTATE THEOLOGICA

NICOLAUS KELLSTRÖM, IN FACULTATE THEOLOGICA DOCENS ET NOTARIUS, publicis, quæ sibi demandatæ sunt, lectionibus in Audit. Eccles. diebus Mercurii et Saturni hora a. m. VIII. usum tractabit Pericoparum homileticum; nec non in Stilo formando sacro fidelem seminario adscriptis pollicetur operam.

JOHANNES THORSANDER, S. THEOL. LICENTIAT. ET DOCENS, in Prænotionibus Theologicis et Historia Ecclesiastica tradendis suam Hon. Commilitonibus operam defert.

JOHANNES BODIN, S. THEOL. CANDID. IN THEOLOGIA DOGMATICA ET MORALI DOCENS, AD BIBLIOTHECAM ACAD. AMANUENSIS E. O. suam qualemcumque H. C. offert operam.

fascinating snares of dissipation and luxury. Their dependence upon the students is such, that unless they discharge their functions with

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## IN FACULATE JURIDICA

DANIEL MYREEN, J. U. DOCT. JURIS PATRII ET ROMANI DOCENS, venia Superiorum peregrinatur.

CAROLUS JOHANNES HAGGREN, J. U. DOCTOR, JURISPR. OECONOM. ET COMMERC. DOCENS, fidelem Hon. Comm. pollicetur operam.

## IN FACULTATE PHILOSOPHICA

JACOBUS EDFELT, LITTERARUM HUMANIORUM DOCENS, in Elementis Æsthetices explicandis Hon. Commilitonibus sedulo aderit. Præterea vero iis, qui vel classica Scriptorum exemplaria volvere, vel stilo ipsi exerceri voluerint, officium suum et operam prefitetur.

SAMUEL GRUBBE, PHILOSOPHIÆ THEORETICÆ DOCENS, in iis, quæ suarum fuerint partium, Honoratiss. Commilitonum inserviet utilitatibus.

JONAS KJELLANDER, POLITICES DOCENS, quæ proxime præterlapsis decenniis fuerint fata regnorum Europæorum, conspectu quodam Historico politico, studiorum Sociis sistere meditatur.

GUSTAVUS WINBERG, HIST. PATRIÆ DOCENS, Populi Suecani fata, instituta, moresque, si qui sua opera uti voluerint, explicare conabitur.

PETRUS SJÖBRING, HEBRÆARUM ET ARAMÆARUM LITTERARUM DOCENS ET AD BIBLIOTH. ACAD. UPSAL. AMANUENSIS E. O. privatiori institutione Hon. Commilitonibus adesse haud gravabitur.

PETRUS SVEDELIUS, GRÆCÆ LITTERATURÆ DOCENS ET FACULTATIS PHILOSOPHICÆ NOTARIUS, Græcum Auctorem explicandi cupidis operam suam lubens commodabit.

JOHANNES PETRUS FRÖBERG, PHYSICES THEORETICÆ DOCENS, in elementa hujus Scientiæ et ad illam applicatæ Matheseos tradenda operam omnem conferet.

LAURENIUS PETRUS WALMSTEDT, MATHEMATUM INFERIORUM DOCENS, Mathesin addiscere cupientibus studium offert et operam fidelem.

JOSEPHUS OTTO HÖIJER, LITTERATUTRÆ ROMANÆ DOCENS, Archæologiam Romanam exponere conabitur. In Auctoribus præterea Classicis explicandis, vel in sermone et stilo latiali juniorum formando, indefessam Hon. Commilitonibus offert operam.

ERICUS GUST. GEYER, HISTORIÆ UNIVERSALIS DOCENS, in hac disciplina tractanda Hon. Commilitonibus haud deerit.

JOHANES OLAVUS HOLMSTRÖM, LINGUÆ LATINÆ DOCENS, Honoratissimis Commilitonibus, suæ disciplinæ vacaturis, studium et operam fideliter navare nitetur.

assiduity and diligence, they may reckon upon a very material diminution of their income.

Natural history, it is well known, has been cultivated at Upsala with a degree of success which has totally altered the appearance of the science. Nor did the cultivation of it begin with Linnæus; though it was to him that it is indebted for the greatest part of its progress. Rudbeck, who preceded him, was a man of uncommon abilities and uncommon industry, and will continue deservedly celebrated in the annals both of Anatomy and Natural History. He patronized Linnæus, and contributed to bring forward that extraordinary genius, whose influence over every branch of natural history became at last unbounded. The history and the labours of this celebrated man are too well known

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SVENO FREDER. LIDMAN, ARABICÆ LITTERATURÆ DOCENS, veniâ Superiorum abest.

## MAGISTRI
## ARTIUM EQUESTRIUM ET CULTIORUM

OLAVUS MALMERFELDT, PRÆFECTUS REGII STABULI, rem Equestrem tractando, studiosæ Juventuti deserviet.

ISRAËL STRÖMBERG, LINGUÆ TEUTONICÆ MAGISTER, præter lectiones h. XII. diebus Mercurii et Saturni in ædibus, quas habitat, publice habendas, privatim etiam hujus Linguæ cupidis, prout vel in Scriptore quodam explicando, vel in scribendo, vel denique in loquendo, exercitationem desideraverint, indefessa opera adesse conabitur.

CAROLUS CHRISTOPH. PORATH, LUDI GLADIATORII MAGISTER ATQUE AD COPIAS LOCUM CENTURIONIS TENENS, suæ in re Athletica peritiæ scitamenta, secundum motus Palæstricos ad arma strenue vibranda, lubens impertiet.

OLAVUS ERICUS ROSELIUS, ARTIS PICTORIÆ MAGISTER, artem delineandi, tam ad naturam, quam ad proplasmata, ut et varias methodos coloribus diverso modo paratis, imagines rerum experimendi docebit.

JOHANNES CHRISTIAN. FRED. HÆFFNER, AD AULAM REGIAM PRÆFECTUS MUSICES SUPREMUS ARTISQUE AD ACADEMIAM UPSALIENSEM DIRECTOR, in iis, quæ sui sunt muneris, regulis atque exemplis, quod oportet, præstare pollicetur scienter et candide.

MAXIMILIANUS DE BETHUNE, LINGUÆ GALLICÆ MAGISTER, Linguam hanc addiscere cupientibus, in Auditorio Ecclesiastico, h. a. m. IX. diebus Mercurii et Saturni, sua publice inserviet opera, nec privatim Studiosæ Juventuti deerit.

ARTIS SALTANDI MAGISTRI munus vacat.

to require to be touched on here. But I forgot to mention, when speaking of the cathedral, that he lies buried in the west end of that building. A plain flat marble stone lies over him, with no other inscription than his name and the date of his death. But on the north side of the cathedral there is an elegant porphyry monument erected to his memory by his pupils. Besides a medallion representing the face of Linnæus, this monument bears the following inscription:

CAROLO A LINNÆE.
BOTANICORUM PRINCIPI.
AMICI ET DISCIPULI.

It is well known that Linnæus was succeeded in the botanical chair by his son, who was but short lived, and that after his death Dr. Smith, President of the Linnæan Society of London, who was at that time at Upsala, purchased the whole collection, books and manuscripts, of Linnæus, for a thousand pounds sterling, and carried them to England. Gustavus III. who had been previously offered the collection, but had declined becoming the purchaser, was indignant when he heard of this sale to a foreigner, which he considered as disgraceful to Sweden. He is said to have given orders to intercept the collection, and to prevent it from being carried out of Sweden. Fortunately for botany, Dr. Smith contrived to elude his search, and arrived safely in England with his prize. He has made a much better use of it than could well have been made in Sweden. Indeed the northerly situation of Sweden, its small power compared with the great Europæan States, its little trade, and comparatively small connection with Asia and America, make it but indifferently qualified for taking the lead in botany. The greatest maritime nation is best qualified for promoting its cultivation. This was done by the Dutch for many years, with the most splendid effect. Britain having now become the greatest maritime nation in Europe, and having driven almost all other European nations both from the East and West Indies, has it now in her power to take the lead in the cultivation of botany. This accordingly has been for sometime the case. Many living British writers might be mentioned who have

acquired very great celebrity by their botanical labours; but it will be sufficient to notice the Transactions of the Linnæan Society, which constitute beyond dispute the most valuable collection of treatises on Natural History any where to be found.

Mineralogy was no less indebted to Sweden and to Upsala for the first steps which it made than botany. I do not notice the mineralogy of Linnæus, nor of Wallerius; though both possessed considerable merit. But the mineralogy of Cronstedt must be admitted to have laid the true foundation of the science, by constituting the chemical composition of minerals, the foundation of the species into which they are divided. The chemical analyses of Brandt and Cronstedt, and above all of Scheele and Bergman, served to make us acquainted with the constituents of many minerals, and thus to class them into accurate species. It does not appear that the Swedes have maintained the pre-eminence in mineralogy, which they had thus honourably acquired. Owing chiefly to the state of mining in Germany, and to the genius of Haüy, the Germans and French have taken the lead in that valuable branch of science, though both the system adopted by the one nation and the other may be originally traced to Sweden.

In chemistry Sweden has long born a conspicuous part, nor has she fallen off in that department of science. Scheele and Bergman (not to go farther back) contributed prodigiously to the great revolution which chemistry underwent; invented many new methods of analysis, and left admirable models of research to their successors. At present Ekeberg is remarkable for the precision of his analyses, a precision which has been rewarded by several notable discoveries. Murray and Hisinger have likewise distinguished themselves by their chemical researches. But by far the most eminent Swedish chemist is Berzelius, who has published a vast deal, is remarkable for the ingenuity of his views, and the precision of his experiments. And seems like Scheele to have devoted the whole of his thoughts, and turned the whole bent of his mind to chemistry alone.

# CHAPTER IX.

## COLLECTIONS IN UPSALA.

The Library—First Book printed in Sweden—Codex Argenteus—Queen Christina's Cabinet—Botanic Garden of Linnæus—New Botanic Garden—Museum of Natural History—Mineral Collection of the Chemical Professors—Mr. Ekeberg—Professor Afzelius—Hyacinth of Bergman—Laboratory—The Afzelii—Royal Society of Upsala.

ONE of the first visits we made after reaching Upsala, was to the library of the University. Being conducted by Mr. Törner, who as librarian was well acquainted with every thing which it contained, we had an excellent opportunity of viewing it to advantage. The library is kept in an elegant room, up one-pair of stairs, and the books, which are numerous, are all in excellent order. From this circumstance I think it may be inferred that the library is not open to the students. If such be the case, it is a defect which cannot too soon be remedied. Nothing contributes so much to promote the ardour, and enlarge the mind of a young man, as free access to a large collection of books. Nor is it easy to conceive how any one can acquire general knowledge, or reach the standard of any of the sciences, in their present advanced state, if his access to books be very imperfect or circumscribed.

Indeed the Swedish students lie under some disadvantages in this respect. The number of scientific readers in Sweden is so small, and the knowledge of the Swedish language so circumscribed, in foreign

countries, that there is hardly sufficient encouragement to publish scientific works in the language of the country. The author who hazards such a publication runs a considerable risk of losing money, by his attempt to extend the knowledge of his favourite science. Hence it happens that the number of scientific books in the Swedish language is but small. Men of science in Sweden are obliged to draw their information from books written in foreign languages. Hence they are all obliged without exception to learn foreign languages. The German being the language abounding in books nearest to Sweden, and Germany being the country from which books can be most easily procured, it is thence that they draw their chief information. Hence every man of science in Sweden understands German: some of them even write it. Similar reasons lead them to a knowledge of French and of English. Hence the first part of their lives is devoted to the learning of languages; and the greatest part of their libraries consists not in Swedish, but in German, French, and English books. Though this circumstance may at first sight appear disadvantageous, I am persuaded that upon the whole it is rather of service to them. It gives them a facility at learning languages, which to a native of Britain, who has never cultivated any such habits, appears very surprising. Understanding German, French, English, and Italian, they may travel with the utmost facility all over Europe, and never can be at any loss to enter into society, or join in the conversation in whatever country they happen to be. What a facility this gives to the collecting of information, and the acquiring of general knowledge, it is easy to conceive. In Britain hardly any person acquires any other knowledge of a foreign language than the being able to read it with facility, excepting those who have lived for some time in foreign countries. But in Sweden I have met with a good number of persons, who had never been out of their own country, and who yet spoke German, French, and English with facility.

The library at Upsala was begun by Gustavus Adolphus, who presented to the University his own collection, and afterwards enriched it with various libraries which he found in different towns taken by him in his wars. For it was always his custom to reserve for himself,

in all places taken by storm, the books as his share of the plunder. His munificence was followed by his daughter Christina, and by several other of his successors. Even different private individuals presented this library with collections of considerable value. I observed, among other books, many splendid copies of most of the Greek and Latin Classics, which, if brought to sale at present in Britain, would bring an enormous price. I saw also the first book ever printed in Sweden, a Latin copy of Æsop's Fables, dated 1482.

One of the most remarkable pieces of literary curiosity in the library is a manuscript of the Four Gospels. It appears to me that the leaves of this manuscript consist of vellum. The letters are of silver, of a considerable size, and seem to be painted; but they are now become so faint, that it is with difficulty they can be read. This manuscript, called from the letters, *Codex Argenteus*, is of a quarto size; the vellum is stained violet, no doubt to make the silver letters, which are all capitals, more easily read. The initial letters and a few other places are of gold. This manuscript consists of a translation of the gospels into Gothic, and there can be no doubt that it is of the highest antiquity. It was discovered in the year 1597, in the library of the Benedictine Abbey of Werden, in Westphalia, by Antony Marillon, who extracted a few passages which were inserted in a commentary on the Gothic alphabet published by Bonaventura Vulcanius. Soon after, Arnold Mercator observed it in the same library, and transcribed a few verses which Gruter published in his *Inscriptiones Antiquæ*. From the Abbey of Werden it was transferred to Prague, while that city was in the possession of the Elector Palatine. At the capture of Prague in 1648, it was found among the literary spoils by Count Konigsmark, and sent as a valuable present to Queen Christina. Isaac Vossius is supposed to have taken clandestine possession of it during the confusion which preceded the Queen's abdication. At his death it was purchased by Count Magnus Gabriel de la Gardie, for 260*l.*, and presented by him to the University of Upsala.

There have been three editions of the *Codex Argenteus*; the first at Dort, the second at Stockholm, and the third at Oxford. The first

was published at Dort, in 1665, by Francis Junius, who borrowed the manuscript for the purpose from Vossius. The text is a *fac simile* of the original. It is a accompanied with observations and a glossary by Thomas Marshall. The second edition published at Stockholm in 1672, by the learned Stiernhelm, differs from that of Junius in giving the text in Latin instead of Gothic characters. Benzelius, first librarian of the University of Upsala, and afterwards Archbishop, comparing these two editions with the original, discovered so many false readings and omissions, that he again collated the manuscript, rectified the mistakes, and made a literal translation into the Latin tongue. As the Gothic types of the first edition published by Junius, were at Oxford, he transmitted these collections and translation, together with various observations, to Mr. Edward Lye, at Oxford, who had distinguished himself by his knowledge of the northern languages. The work was undertaken and faithfully executed by that judicious scholar; and the third edition made its appearance in 1750, from the Clarendon press. To the observations of Benzelius, Lye added many learned remarks on the text and version and a Gothic grammar. This edition is esteemed, by those who have compared it with the original manuscript, a complete work. It redounds greatly to the honour of the Editor's accuracy. Two opinions are entertained respecting the *Codex Argenteus*; the first, that it is written in the language and character used in the fourth century, by the Goths of Mæsia, the ancestors of the present Swedes, and that it is a copy of the version made by Ulphilas:—the second, that it is a translation in the Frankish idiom. Respecting the truth of these opinions, it is impossible to decide; many learned men adopting the one, and many the other, though the weight of evidence seems to incline rather more to the first opinion than to the second. It is allowed on all hands to be more ancient than the vulgate translation of St. Jerome. If it be the translation of Ulphilas, it cannot be of later date than the middle of the fourth century. No body has considered it as later than the sixth century.

The library of Upsala is not very well supplied with British periodi-

cal works, down to a very late date. For example, I observed that the last volume of the Philosophical Transactions, which they had, was for the year 1803. This work in the library of the Academy of Sciences, at Stockholm, was down to the year 1811. This indicates a carelessness on the part of the University, and seems to prove that none of those persons, who have the power of procuring books for the library, are at great pains to make themselves acquainted with new discoveries in the sciences, as they make their appearance. This is an indolence and indifference at which I was not at all surprized, having found it existing, to full as great an extent, among the professors of another celebrated University, as it could do at Upsala. About the year 1798, I was very anxious to consult a particular foreign book which had been published in the year 1783: I applied to the librarian of a certain University for it, and was told by him, that it had been taken out by a certain professor, whom he named, soon after its publication, and had never been returned. I prevailed on the librarian, who was my particular friend, to request of the professor to return it. He did so, and in a few days sent me the book, which, to my great surprize, I found with its leaves still uncut.

There is a curiosity in the upper end of the library room, which I viewed with some interest, on account of the person to whom it had belonged, the cabinet of Queen Christina, with which she had amused herself during her childhood and youth. It is a four-sided high wooden cabinet, of neat workmanship, adorned with ornaments of ivory, glass, agate, and rock crystal, distributed into various figures with much taste. It contains numerous drawers and other compartments, which are filled with polished stones of various sizes, mostly embellished with paintings, and with a variety of trinkets, such as scissars, knives, thimbles, &c. &c. They are curious, because they show the taste of the age, and the degree of skill in workmanship, which at that time prevailed. None of the stones which I observed were of any value as precious stones; the most beautiful among them consisted of agates and chalcedonies.

After seeing the library, our next object of curiosity was the house

and botannical garden of Linnæus, to which we were likewise conducted by Mr. Törner. There is a certain interest attached to the places that have been frequented by illustrious men, or which have been rendered remarkable by any great event. We feel a kind of pleasure in surveying these places; it is difficult to tell why, but the feeling, however it may originate, is almost universal, and it carried us with considerable eagerness to a spot where nothing was be to seen but devastation and ruin. The house of Linnæus stands in *Swartzbäck gatan* (Blackstream-street). It is two stories high, covered with plaster on the outside, and appears large and commodious. At present it is partly occupied by the music master belonging to the University, and partly by Adam Afzelius. The garden is immediately behind and contiguous to the house, divided into three compartments. It was the botanic garden of the University before the time of Linnæus, and seems to have been selected for the purpose for very good reasons. It has every appearance of being the best sheltered and warmest spot in the whole neighbourhood of Upsala. The apartment in the garden where Linnæus used to lecture is still standing, and the range of hot-houses and green-houses on both sides of it have not been altered. But the glass panes of all of them have been destroyed by time, the green-house plants have been removed, and the floor is covered with a rich crop of docks, nettles, and other common weeds. The range of apartments where he kept his animal preparations is likewise unaltered, but every thing which they contained has been removed.

Two of the compartments of the garden are precisely in the state that Linnæus left them. His small ponds, his artificial rocks, and even some of his plants may still be seen. But the greatest part of them is covered with grass and with weeds, and presents one of the mostdesolate and disagreeable sights imaginable. The third compartment has been converted by Adam Afzelius into a potatoe garden.

The reason of all this desolation is, that, after the death of Linnæus, Gustavus III. was at the expense of a new botanical garden to the University, because the old one was too small. He refused to be at

the expense of both gardens. The botanical garden of Linnæus belonged to the University, and their funds not being sufficient to enable them to keep it in order, the consequence has been, that it has been allowed to fall into the desolate state in which it now is. It would have been for the interest of botany to have kept up the old garden, notwithstanding the new, as it was better situated, and of course better adapted for the rearing of delicate plants. Besides, the preservation of his garden and his plants was an honour to which the genius and splendid exertions of Linnæus entitled him. But as neither gratitude nor shame ever exists in a body of men, we need not expect from them either generosity or gratitude.

The new botanic garden lies on the west side of the palace, and is much larger than that of Linnæus. As far as I could judge from merely walking through it, this garden is kept in very good order. The number of plants which it contained did not appear to be great. The hot-houses are small, and the number of trees struck me as few; but every person must be aware that it is impossible to form any accurate opinion of a botannical garden by merely walking through it. To have formed a precise idea of the number of species which it contained, would have required the labour of several days; but it must be obvious, that neither the climate nor the commercial relations of Sweden are compatible with a very numerous collection of plants in their botanic gardens. The botanic garden is beyond comparison the first in Sweden: that at Lund, though in a milder climate, has never contained any considerable number of plants.

Adjoining the botanic garden is an elegant building where the lectures on botany and natural history are read. We paid it a visit of course, and took a cursory view of the animals and other departments of the collection. I was somewhat curious to see its extent, because I conceived that it was from it chiefly, and from the collection belonging to the Academy of Sciences in Stockholm, which must have been insignificant in his time, that Linnæus drew those characters which constitute the foundation of his *Systema Naturæ*. Though this collection is but small compared to those that may be seen at Paris and in some other places, yet it must be allowed to be very respectable; and

might well have served as a foundation for the classification of Linnæus. The collection of shells is very good—this I was the more surprized at, because I conceive Linnæus's arrangements of shells to be one of the most defective in the whole range of his classes. It was indeed much less perfect at first than it afterwards became. But even after receiving the last corrections of its author, it must be admitted to be a very inadequate classification of these beautiful but difficult objects of arrangement.

The house and laboratory of Bergman, and the collection of minerals belonging to the University of Upsala, were likewise objects of considerable curiosity with me. For this purpose I waited upon Mr. Ekeberg, with whose name, in consequence of his publications I was previously acquainted. I found him in a bad state of health, almost blind, and so deaf that it was very difficult to keep up a conversation. Besides, he had a difficulty in speaking from a disease in his breast. Notwithstanding his unfortunate situation he received me with the utmost politeness and kindness, and presented me with a set of specimens of the remarkable minerals which he had analysed, and which were now so scarce that they could not be procured. These were *gadolinite* and *yttrotantalite*. From him likewise I obtained specimens of Swedish *titanite*. Not being in a condition to bear the fatigue of showing me the laboratory and the mineral collection, Professor Afzelius, to whom he introduced me, was so obliging as to undertake the task, and he went through it with a degree of politeness and readiness, which added greatly to the obligation. The mineral collection at Upsala is by far the completest of any that I saw, during my stay in Sweden. By far the most valuable part of it, indeed, perhaps I may say almost the whole, was collected by the present Professor of Chemistry, John Afzelius, who travelled for the purpose, at least as far as Copenhagen and Germany, and was certainly very successful in his objects. A great many show specimens are arranged upon a long table covered with glass. The great body of the collection is arranged in drawers, in two small rooms at the two extremities of the long room in which the show specimens are exhibited. It would take too

much time to attempt to particularise the minerals contained in this collection. It appeared to me to contain specimens of almost all the known species. I could not perceive that it was arranged according to any particular system. Indeed this observation applies to Sweden in general: no preference is shown either to the method of Werner or that of Haüy. The systematic collection of Svedenstierna indeed is arranged according to the method of Haüy, because it was formed while he was attending the lectures of that eminent mineralogist. But he has not adopted the same method for his Swedish minerals.

The collection at Upsala contains many splendid specimens from Siberia, Norway, and Great Britain. Nor is it poor in Swedish minerals. Among others, I saw a large and complete crystal of pyrophysalite, which I mention because it is uncommon to find the crystals of this mineral, when of a certain size, in any other state than that of mere fragments. This crystal was above three inches in length. It was of the shape in which this mineral most commonly is found, a double four-sided pyramid, truncated at both ends, and the faces of the one pyramid opposite to the edges of the other. If I recollect right there is an accurate account of the crystals of pyrophysalite by M. Haüy, published in the first number of the Transactions of the Natural History Society of Moscow.

Some mineralogists having conceived that the *hyacinths* analysed by Bergman were in reality not hyacinths, but belonging to the mineral afterwards distinguished by Werner by the name of *cinnamon-stone*, I conceived that I had a good opportunity to determine the point. I requested Professor Afzelius to show me the very specimens which constitute the hyacinths in Bergman's collection, and out of which he had taken the specimens which he had subjected to analysis. As Afzelius was Bergman's assistant at the time, he knew the whole history of the analysis, and brought me the very box unaltered in which Bergman's hyacinths were contained, and from which he had taken his specimens. There could be no doubt from their appearance that they were real hyacinths. They had no resemblance to the cinnamon-stone. I asked Professor Afzelius if he had determined their specific gravity. He as-

sured me that it was the same with that of the hyacinth. The errors in Bergman's analysis cannot therefore be explained, from the supposition that the mineral which he examined was really a different species. It was owing to the imperfection of his method, and the small progress which analytical chemistry had at that time made. I have no doubt that many an analysis made in more recent times will be found inaccurate from the same causes.

I could not find that there was any complete collection of rocks in the mineral cabinet of Upsala; nor indeed did much attention appear to be paid to geognosy in that university. I inquired after the geographical collection of the Swedish minerals which Bergman is said to have made; but was told by Afzelius that it was very small and of little value. Indeed after seeing the mineral cabinet belonging to the College of Mines at Stockholm, I could not expect any new information on the subject from the collection at Upsala. But I wished to be enabled to judge of the real extent of Bergman's mineralogical knowledge. The specimen which he has given us of the sagacity of his views in his Treatise on Volcanoes, and his Dissertation on the Mountains of West Gothland, is certainly very favourable. I likewise inquired after the models of chemical machines and works which Bergman is said to have collected. Afzelius showed me a few, I suppose all that ever existed. They were not collected by Bergman; but presented to him by Von Swab.

After satisfying myself with the mineral collection, I visited the laboratory and lecture room. As no experiments were going on in the laboratory, and all the apparatus was laid up, it was impossible to judge of the nature of the apparatus. The room was small but well fitted up, and any chemical experiment whatever might be conducted in it without inconvenience. I was struck with the small size of the lecture room. I should conceive that it would not hold above 40 students. This affords a striking proof of the small number of persons in Sweden who interest themselves in the science of chemistry.

There are no less than three brothers of the name of Afzelius at Upsala; two of them professors and one an assistant professor. They

are nephews of Professor Bergman. John Afzelius, the Professor of Chemistry, was Bergman's assistant, and is conceived to have contributed very much to those experiments from which Bergman derived his celebrity. Since he succeeded to the chemical chair, his health has been uniformly so bad, as to prevent him from taking an active part in the progress of the science. Peter Afzelius, Professor of Medicine and President of the Academy of Sciences, when I was at Stockholm, is physician to the Crown Prince, and surgeon general to the army. His duties oblige him to be often absent from Upsala, and it was believed by every person that he would speedily resign his chair. I even met at Gottenburg the gentleman whom it was believed he intended to make his successor. At Upsala the assistant professors have generally the greatest chance of succeeding to the vacant chair, though this does not always happen. Indeed the situation of assistant professor seems to be courted chiefly as a necessary step towards the professorship when it becomes vacant. The professorships are all in the gift of the crown.

Before leaving Upsala I must notice the Royal Society of that place. It is the oldest association of the kind in Sweden. It began in the year 1720. Benzelius, librarian to the University, and afterwards archbishop of Upsala, began, in conjunction with several other learned men, a review of all Swedish books, and of all foreign books that had any connection with Sweden. As this review contained likewise some original papers, it was called *Acta Literaria Sueciæ.* In 1730 the review was in a great measure dropped, and the Transactions consisted almost entirely of original papers. On that account the Society, being patronised by the King of Sweden, styled itself *Societas Regia,* and the Transactions *Acta Literaria et Scientiarum Sueciæ.* In 1740 it assumed the title of *Societas Regia Literaria et Scientiarum Upsaliensis,* in order to distinguish itself from the Academy of Sciences in Stockholm, which had assumed the name of *Academia Regia Sueciæ.* The Society ceased in 1750; but was again revived in 1772, and the transactions were published under the name of *Nova Acta Regiæ Societatis Scientiarum Upsaliensis.* These transactions are published occasionally

in separate parts; they are written in Latin, and have the quarto form. The greater part relate to the history and antiquities of the north, though there are likewise some dissertations both on science and natural history. Both Linnæus and Bergman have occasionally inserted papers in the *Acta* of the Royal Society of Upsala. The number of volumes is not great, as the Society has no fund, and only publishes occasionally.

# CHAPTER X.

## JOURNEY TO DANNEMORA.

Iron Mines in Upland—Russian Soldier—Mr. P. Tamm—Description of Dannemora Mine—Ore—Method of smelting—Superiority of Dannemora Iron—Gökum-Gahnite—Ytterby—Gadolinite—List of the Iron Mines in Upland.

THE province of Upland contains a considerable number of iron mines. They consist of veins, and the mineral, as far as I have had an opportunity of examining it, is chiefly *magnetic iron-stone*, more or less mixed with other substances. Dannemora being the most celebrated iron mine in Sweden, and yielding iron of greatly superior quality to any other mine in the kingdom, it was to it that I directed the greatest share of my attention.

Dannemora lies 30 English miles north of Upsala, in a singularly beautiful situation. I set off for it from Upsala about three o'clock in the afternoon on the 18th of September. The day was dry and pleasant, but cold. During the course of the evening there fell a heavy shower of hail, and in the night, between the 18th and 19th of September, there was a considerable fall of snow a little to the north of Dannemora, though none was visible from the inn where I lodged. The stages were three, namely, Uggelsta, Andersby, and Österby, where I stopped all night. It is quite contiguous to Dannemora, and within an English mile of the mine. Being detained at every stage for horses, it was late before I reached the inn where I intended to lodge.

The stage between Uggelsta and Andersby, the horses were under the charge of a Russian from the neighbourhood of Moscow. He had been a Russian soldier, and by his own account had been peculiarly unfortunate. He had been three years prisoner in Turkey, two years in France, and had been made prisoner by the Swedes in the late war in Finland. At the peace he did not choose to return to his own country, but preferred living in Sweden, and had entered into the service of a Swedish peasant. He spoke the Swedish language quite fluently. I asked him if he understood French; he gave me to understand that he could not speak it, but that he understood the meaning of the words. I was told that there were about 500 Russian soldiers in Sweden in the same predicament with this man. A proof of the hardships which Russian soldiers undergo, when they prefer banishment from their own country to the continuance of them. I know an instance of a French soldier in the same situation in Great Britain. He had been taken with General Junot in Portugal, and instead of returning to France with that army, he chose to enter into the service of one of our officers. He is at present servant to a gentleman of my acquaintance in London, speaks our language fluently, and seems to have lost sight altogether of his own country.

At Österby lives Mr. P. Tamm, a principal proprietor of the mine of Dannemora. He has a smelting house and forges on the spot, and possesses one of the best qualities of iron that Dannemora produces. To this gentleman I had a letter of introduction from Stockholm, and was received with that affability and hospitality which distinguish the Swedes, and render the houses of their country gentlemen most delightful places of resort for the traveller. He carried me to the mine in his carriage, explained its situation, its structure, and the different qualities of its ore, and assisted in selecting the proper specimens for examination and analysis. He showed me likewise his own works at Österby, and explained the method employed in smelting the ore, and in reducing the cast-iron to malleable iron. All these were objects of great interest to me, as they might have a tendency to explain the

reason of the great superiority of Dannemora iron over every other species with which we are acquainted.

The iron mine of Dannemora lies in a hill so little elevated above the surface of the neighbouring country, as easily to escape observation. It may be nearly two English miles in length, and not quite half a mile in breadth. It is almost surrounded by lakes: the lake of Dannemora, of Films, and of Grufve (*mine*), lying quite contiguous to it; that side which is not enclosed by water is a moss, where turf is dug: this turf has been tried as a fuel for smelting the ore; but has been found greatly inferior to the turf in other parts of Sweden. The iron ore occupies a very large vein in this hill, which runs in a north-west and south-east direction.

The mine of Dannemora has been wrought for these 300 years and more; for the exact period of its origin is not certainly known. It was first wrought as a silver mine: the silver being extracted from galena, which is still found in the vein, though in very small quantity. The galena, as far as I could learn, occurs only in the *södra grufva*. This source of emolument soon failing, or becoming unproductive, the iron ore began to be extracted and smelted, and the goodness of the iron obtained gradually drew to it the attention of the public. At first it was the property of the King of Sweden, who consigned it over to the Archbishop of Upsala as a part of his revenues. At present it belongs to a number of private individuals, who work it separately, each on his own account. The nature of the situation is such, that water cannot be procured to drive the requisite machinery. On that account they have been obliged to erect a steam engine, without which, I was told by the mine master, it would have been impossible to have continued to extract the ore. Some years ago the mine was overflown by a great inundation of water from the neighbouring lakes. To prevent such an inconvenience from recurring, a strong stone wall has been built, at a considerable expense, to keep off the water.

When you go to the side of the mine you find a great opening, about 50 fathoms deep, and perhaps 50 feet wide. From the bottom

of this opening, which has been formed by the extraction of ore, you enter into the mine by a passage which does not extend a great way. I did not descend farther, but was told that the mine was wrought about 30 fathoms deeper than this opening. The ore is blasted out with gunpowder. The vein is distinguished by three distinct names, according to its situation and the quality of the ore which it yields. For, though all the Dannemora ore is good, there are some portions of it much better than others. That part of the vein which lies under the great opening, which constitutes the mouth of the mine, is called *stor rymning*. It constitutes by far the greatest portion of the mine. The next portion is called *jord grufva*, (earth mine), and it yields the ore of the very best quality. The farthest south portion is called *södra grufva*, (southern mine). It yields the worst kind of ore of all the three, probably because it is mixed occasionally with *galena* and *blende*.

The rock in which the Dannemora vein runs, as far as I could learn, is quartz. But I had no opportunity of examining it, as I could find no portion of it laid bare. The substance immediately contiguous to the vein appeared to me to possess the characters of horn-stone, and to contain hornblende. The Swedes call it *hälleflinta*, a name under which they confound *quartz*, *horn-stone*, and *compact felspar*. The iron ore itself is mixed with lime-stone, with quartz, with actinolite; and chiefly in consequence of these mixtures it varies very much in the quantity of iron which it yields. Sometimes it produces only 25 per cent. of cast-iron, sometimes as much as 75 per cent. In the södra grufva ore I saw specimens of blende, sometimes so intimately mixed with the iron ore, that the eye could only detect its presence by the colour and aspect; at other times in distinct masses of considerable size. In the same ore I saw likewise fluor spar, galena, and amethyst, but all of them in such small quantities that they are considered as rarities. The lime-stone contains a mixture of manganese, and from the aspect of the iron ore itself one would be apt to suspect the presence of the same mineral in it. I do not believe that the Dannemora ore has ever been analysed, which is a very odd circum-

stance, considering its importance, and a reproach to those chemists who have had it in their power to ascertain its nature.

Calcareous spar crystallized in dodecahedrons sometimes also occurs in this vein. So I am told does sulphate of barytes; but I was not so lucky as to observe any specimens of that rare mineral in Sweden, though so abundant in Great Britain. Specimens of mountain cork likewise occur occasionally. I saw several preserved in a small mineral cabinet belonging to the mine. There is also a mineral occasionally met with, (though I did not see it,) which is considered in Sweden as the *Aplome* of Haüy. Its colour is brown, and it occurs crystallized in irregular dodecahedrons with trapezoidal sides. It has but little lustre, and its specific gravity is 3·902. According to the analysis of C. A. Murray, its constituents are as follows;

| | |
|---|---|
| Silica | 34·04 |
| Alumina | 18·07 |
| Lime | 16·56 |
| Magnesia | 0·56 |
| Oxide of manganese | 23·51 |
| Oxide of iron | 10·03 |
| | 102·77 |

The ore is broken into small pieces and then roasted. It is then put into conical-shaped furnaces, constructed of the slag from cast iron, which is found to answer the purpose fully as well as bricks, and to come much cheaper. In these furnaces it is mixed with the requisite quantity of charcoal, but the addition of limestone is seldom necessary, because it exists already in the ore. Here it is melted and separated from the slag, which is allowed to run off, or cast into bricks according as it is wanted. The cast iron obtained by this process is as white as silver, completely crystallized, extremely hard and brittle, and incapable of being applied to any useful purpose in that state. It is not liable to rust, and indeed this is a quality which Dannemora iron possesses, both in the state of cast and malleable iron. It is much less liable to rust than any other kind of iron whatever.

This cast iron is reduced to malleable iron by heating in a bed of charcoal and oxide of iron, and hammering it out into bars while hot. In this state it is whiter than common iron, of a distinctly fibrous texture, and much stouter than any other species of iron whatever. It goes all to England, and indeed the greatest part of it is purchased by a particular merchant in Hull. In this country it is converted into steel. I was told in Sheffield, that they have not been able to make cast steel from any other iron but the iron of Dannemora. The best Dannemora iron is marked by three balls. This is the kind which is manufactured by Mr. Tamm. He politely supplied me with abundance of specimens of his iron in all states, for the purpose of chemical examination.

Mr. Tamm has likewise a manufactory of steel by cementation. The process seemed to me to be exactly the same with that employed at Sheffield, and in other parts of Great Britain, for the same purpose. The steel remains in the bed of charcoal nine days. The firewood is birch, which yields more heat than any other species of wood used as firewood in Sweden. The two steam engines at Dannemora are at present kept going by means of wood. But it is intended to import coals from England for that purpose, which no doubt would be a considerable saving. The Swedish coals are at such a distance, so inferior in value, and so high priced, that the employment of them is out of the question.

The cause of the superiority of Dannemora iron has never been explained. Some conceive it to be owing to the presence of manganese. Berzelius ascribes it to the presence of the metal of silica; while a third party, with some appearance of reason, ascribe the greatest part of the superiority to the process employed. I was even assured by one gentleman, who has bestowed particular attention to the subject, that by following a similar process he has obtained as good iron from other Swedish ores. But that something is due to the ore itself is evident, I think, from this circumstance, that the quality of the iron (though the same process, is followed, I presume, by all,) differs a good deal, according to the part of the vein from which the ore was taken.

The quantity of iron which the mine of Dannemora yields in a year amounts to above 4000 tons. There are other Swedish mines that yield much more iron, though not of so good a quality.

The soil round Österby is uncommonly sandy. During the last night that I was there, it rained furiously for many hours; yet next day the road was quite dry, and no traces of the rain could be observed.

About seven miles south-west from Dannemora, at a place called Gökum, there is a lime quarry which deserves to be mentioned. The limestone is primitive, and yields, according to Rinman, 16 per cent. of iron. This limestone contains tremolite; it contains likewise another mineral, which has attracted some attention in Sweden. It was first described and analysed by C. A. Murray. Afterwards another description by Lobo, the Portuguese Ambassador at that time in Sweden, and analysis by Berzelius, were published. Lobo gave it the name of Gahnite, in honour of assessor J. G. Gahn, at Fahlun. This mineral I had an opportunity of seeing by the politeness of Mr. Tamm, who presented me with a specimen of it. I shall here give a description of its characters and constituents.

Its colour is dark olive green. Its specific gravity 3·543.

It scratches glass; but is itself scratched by quartz—brittle and easily frangible.

Cross fracture uneven and fine granular, splintery, here and there passing into small conchoidal. Longitudinal fracture foliated.

External lustre strongly shining; internal, feebly shining; lustre between resinous and vitreous.

Fragments indeterminate angular; angles not particularly sharp.

In thin splinters it is translucent.

Before the blowpipe, upon the point of a platinum wire, it melts pretty easily into a yellow brown porous glass, frothing a little at the commencement. With borax upon charcoal, it melts into a sea green glass bead.

It shows no signs of electricity, either by rubbing or heat.*

* The above description is translated from Lobo. Not having my own specimen, I durst not venture to make any alterations in it from memory.

The constituents of this mineral, according to the analyses of Murray and Berzelius, are as follow;

| | Murray.* | Berzelius.† |
|---|---|---|
| Silica | 35·87 | 36·00 |
| Lime | 34·32 | 37·65 |
| Alumina | 17·87 | 17·50 |
| Magnesia | 2·78 | 2·52 |
| Oxide of iron | 6·75 | 5·25 |
| Oxide of manganese | 0·31 | 0·00 |
| Volatile matter | 0·25 | 0·36 |
| | 98·17 | 99·28 |
| Loss | 1·83 | 0·72 |
| | 100·000 | 100·000 |

The term Gahnite had been previously given to other minerals. The substance called *Fahlunite*, to be noticed hereafter, is sometimes distinguished by that name. This circumstance, though intended to do honour to a man highly deserving of such a distinction, is unfortunate; because it has a tendency to throw confusion into a branch of knowledge already unhappily remarkable for a prodigious multiplicity of redundant names. Many people seem to aim at the distinction of conferring new names, as if it were the only means of acquiring eminence in mineralogy, a branch of science which requires, above all others, accurate powers of discriminating.

It would be improper, while giving an account of the minerals of Upland, to pass by the quarry of Ytterby, become famous from the curious substances that have been found in it. It lies rather less than two English miles north from the fortress of Vaxholm, and consists of a rock obviously connected with gneiss, that constitutes the basis of the country; though it consists chiefly of beautiful white felspar, and fel-

* Afhandlingar i Fysik, Kemi och Mineralogi Utgifne af W. Hisinger och J. Berzelius, Vol. II. p. 179.

† Ibid. Vol. III. p. 276.

spar of a flesh red colour. It contains pure white quartz, in separate masses; both the quartz and the felspar are of a quality adapted for the manufacture of porcelain. There are also layers of mica; but like those of the quartz they occur separately, and not mixed with the other minerals. So that this rock contains all the constituents of granite or gneiss; though not arranged in the usual manner. An irregularity by no means uncommon in the primitive rocks. It was in the flesh red felspar that Arhenius discovered the black conchoidal mineral, afterwards distinguished by the name of Gadolinite. Its specific gravity is above 4. It was analysed by Gadolin, and found by him to contain a new earth, to which the name of *Yttria* was given, from the appellation of the quarry where the gadolinite is found. Probably the most accurate analysis of gadolinite, is the last one which was made by Ekeberg, and which I shall here state. It was as follows:

| | |
|---|---|
| Yttria | 55·5 |
| Silica | 23·0 |
| Glucina | 4·5 |
| Oxide of iron | 16·5 |
| Volatile matter | 0·5 |
| | 100·0 |

It was in the felspar likewise of this quarry that Ekeberg found the mineral, in which he detected the metal called by him Tantalum, and which, Dr. Wollaston has since shown, possesses the same properties with the Columbium of Hatchett. To this mineral, from its containing both yttria and tantalum, Ekeberg gave the name of Yttrotantalite. Neither gadolinite nor yttrotantalite are now to be found in the quarry of Ytterby, except by the rarest accident. But gadolinite has been found in other parts of Sweden, particularly in the neighbourhood of Fahlun.

I shall terminate my account of Upland, with a kind of catalogue of the principal iron mines in it; that the reader may be able to form

some notion of the degree of riches which it possesses in this respect.

1. Dannemora, the first in eminence, has been already described.

2. Kalkberg, in the parish of Film, wrought since the year 1694.

3. Engeskär, in the parish of Hollnäs.

4. Valla, in the parish of Vessland.

5. Hytteön, in the parish of Elfkarleby.

6. Väsby, in the parish of Tierp, wrought since the year 1691.

7. Burunge, in the parish of Vendel.

8 and 9. Släsby and Vattholma, in the parish of Lena.

10. Gromur, in the parish of Björklinge.

11. Skallby, in the parish of Rasbo Kihl.

12. Ramhäll, in the parish of Alunda. The ore yields from 41 to 55 per cent. of iron. It is mixed with limestone, hornblende, and mica. In the same parish a bed of steatite occurs.

13, 14, 15, 16, 17, 18, 19. Vamsta, Botilsbo, Rörberg, Fogelleks, Longbro, Djupkärret, Jufvansbo, all in the parish of Valö.

20, 21. Grosätra and Mellby, in the parish of Börstel.

22. Björsta, in the parish of Harg. It lies in mica-slate, has been wrought since the year 1664, and yields at an average about 60 per cent. of iron.

23. Rodarne, in the parish of Hökhufvud.

24, 25, 26. Herräng, Longskär, Lappgrufve, in the parish of Häverö.

27. Massom, in the parish of Väddö.

These are the principal iron mines. The ore is always magnetic iron stone. It occurs usually, if not always, in veins, and is most commonly accompanied with limestone. Besides the iron mines there is likewise a copper mine in the province of Upland, but of no great consequence. It is called Björnebo, and lies in the parish of Valö. There is also a lead mine, or, as the Swedes choose to term it, and as they in reality render it by their injudicious mode of working, a silver mine in the same province. It is called Borggords, lies in the parish of Hök-

hufvud, and is said to yield 10 per cent. of silver. But this must be a mistake. I do not believe that any variety of galena (the ore of this mine) ever was found that gave a return of silver nearly approaching to that quantity. It is said likewise that the lead mine of Forsby, in the same province, which continued to be wrought till the year 1719, yielded 4 per cent. of silver. An estimate which I conceive likewise to be greatly beyond the truth.

# CHAPTER XI.

## JOURNEY TO FAHLUN.

Soldiers' Houses—Swedish Sirnames—Rout to Sala—Detained for Horses—Rout to Fahlun—Singular Bridges—River Dal—Character of the Dalecarlians—Description of the Province—Account of the Swedish Hills—Nature of the Porphyry Tract at Elfdal—Hisinger's Classification of Rocks—His Account of the Structure of Dalecarlia—Inferences.

WE left Upsala about four o'clock in the evening, intending to take the shortest road to Fahlun; but by the stupidity of our servant, who made no inquiry, and the ignorance of the boy who went with the post horses, we took the wrong road, and not only went 14 miles about; but had the misfortune to pass through a tract of country very little frequented, where posting was unusual, and where we were sure to be detained at every stage for post horses. The day was fine and rather warm, and the sky almost without a cloud. The country through which we passed that day was level, and appeared very well cultivated. We had an opportunity of observing a considerable number of houses belonging to soldiers, with the fields surrounding them, by the cultivation of which they supported themselves and families when not actually in the field. These houses and fields gave one a favourable idea of the industry of these men. The houses were in rows, each at a considerable distance from its neighbour. They were constructed of wood, and small, but in the neatest order. The fields looked also well, and bore good crops. The Swedish peasants have not

yet introduced the custom of adopting permanent surnames which distinguish the family. But a son takes for his sirname the Christian name of his father, adding to it the word son. Suppose for example that the Christian name of the father were Jacob or Eric, then the sirname of the son would be Jacobson, or Ericson. The same custom formerly prevailed in Great Britain, and accounts for the great number of sirnames in this country, terminating in son. It seems to be this want of sirnames in Sweden that has introduced the custom of young men, when they enlist, assuming new names. This they uniformly do; and these names are often very fanciful, adopted from some tree, as Hasselquist (*Hazeltwig*), from the names of places, from the colour of the hair, or from any supposed quality of the mind.

When we approached Dalcarsbo, which was our first stage, rocks began to make their appearance in considerable quantity. They were all granite. At this place the fields are surrounded with rude stone walls, built after the manner of what are called Galloway dykes in Scotland. The materials of all these walls was a beautiful species of granite. At Dalcarsbo we were detained an hour for horses; so that it was dark before we set off. We travelled slowly all night, being detained at every stage for horses, and it was half-past eight next morning before we reached the town of Sala. Our stages and distances were as follows:

| | Swedish. | English. |
|---|---|---|
| Dalcarsbo | 2 miles | 13¼ miles. |
| Ekelunda | 2¼ | 15 |
| Logbo | 1½ | 10 |
| Harfsta | 1½ | 10 |
| Sala | 2 | 13⅓ |
| | 9¼ | 61⅔ |

At Sala, which is a considerable town in Westmanland, we breakfasted, and were detained for horses no less than four hours and a half. It is a circumstance which at first sight appears unaccountable, that you are always, in Sweden, detained a much longer time for horses in

the towns than in the country. But the reason is that the horses (at least in summer) are not kept in stables, as in this country; but are always turned out to graze in the fields. Hence the distance at which horses are to be sought is greater in towns than in the country. Besides there is a greater demand for horses, and this from the peculiar regulations of the Swedish post houses must occasion a greater scarcity of horses, and a greater consequent delay in procuring them. As the post masters enjoy a monopoly, they have no rivalship to contend with: it is not their interest to be expeditious, but the contrary, because the longer the traveller stops in their house the more money is it likely that he will spend. Hence the phlegm and indifference with which they set about procuring horses is peculiarly characteristic of the situation in which they are placed, and peculiarly galling to a man from Great Britain, who has been accustomed to a very different kind of treatment in the inns of his own country. By paying a little extra postage you can sometimes contrive to quicken them, and to procure horses after being assured that none are to be found.

The country round Sala deserves a particular description; but as I afterwards paid it another visit in order to examine it more carefully, I shall reserve my account of it till a subsequent chapter.

We left Sala, after much impatient waiting, about one o'clock, and travelling without stopping, except at the post houses where we were always detained some time for horses, we reached Fahlun about seven o'clock next morning, Saturday, Sept. 12. Our stages and distances were as follows:

| | Swedish. | | English. |
|---|---|---|---|
| Brodbo | $1\frac{1}{4}$ | mile | $8\frac{1}{3}$ miles. |
| Wiggarne | 1 | | $6\frac{2}{3}$ |
| Brunbäck | $1\frac{3}{4}$ | | $11\frac{2}{3}$ |
| Grädo | $1\frac{3}{4}$ | | $11\frac{2}{3}$ |
| Upbo | 2 | | $13\frac{1}{3}$ |
| Strand | $1\frac{1}{2}$ | | 10 |
| Fahlun | 2 | | $13\frac{1}{3}$ |
| | $10\frac{1}{4}$ | | 75 |

The country between Sala and Fahlun is remarkably beautiful, especially after you enter Dalecarlia, a little to the south of the river Dal. I travelled it more than once, and therefore had an opportunity of seeing every part of it. For the first time we passed through it, some part of the view was lost, as we travelled in the night. The road from Sala to Brodbo lies in part through a shallow lake. It is constructed of wood at a considerable expense; and being nearly upon a level with the surface of the lake which encloses it on both sides, it has a novel and beautiful effect. Wiggarne lies altogether out of the line of our direction, the road from Brodbo to it running south west: but it has been taken into the circuit, I presume for the emolument and gratification of some postman of interest, who has established himself at Wiggarne. However, the next time I travelled this way, I prevailed upon the post-boy, who was a lad of spirit, to take the direct road, by which I saved about seven miles of most disagreeable sandy road, through a thick forest of pines, which totally excludes all view. This forest continues till we reach Brunback, which is in Dalecarlia, and upon the banks of the river Dal. Here the forest withdraws, the country opens to view, and being finely variegated with gently rising hills and winding valleys, chequered with lakes and striped with rivers, has a fine effect upon the traveller, heightened considerably by the long dull tract of pine forest through which he has been travelling.

The river Dal is a considerable stream, though much too shallow for the purposes of navigation. It is wide, and at the time I saw it was so stagnant that it rather resembled a lake than a river. It is liable to sudden and considerable swells, which raise it greatly above its usual level. In consequence of this circumstance, and the lowness of its banks, it has been found impossible to build over it a stone bridge. Yet as the road to Fahlun crosses it no less than twice, a bridge was obviously necessary, and a very ingenious one has been constructed of wood, which is perfectly safe; but of a construction so totally new to us as to excite considerable surprize. Indeed my fellow traveller was so much alarmed, that he hastily threw aside his great coat in order to be ready to swim, in case the carriage, as he expected, should be thrown into the river.

It consists of a very strong stage of large square trees floating under water, and so attached to each other, and connected with the banks, that though they float at full liberty, they cannot be carried down the river. Over the middle of this stage, the upper part of which is just on a level with the surface of the river, is fixed a close row of square trees about eight or ten inches thick, and about twelve feet long. These logs, lying in the direction of the river, constitute a kind of floating bridge, over which a man may walk perfectly dry footed, but when a carriage or loaded cart presses on them they sink a few inches under water; so that a small portion of the wheels, and even of the horses' feet, sinks under the water. The rattling of this seemingly loose bridge, the splashing of the water as the carriage passes on, the sinking and rising of the boards, have a very odd effect. But I satisfied myself, by a careful inspection of several of these bridges, that they are perfectly safe. There is a wooden parapet on both sides to prevent the horses, or any other animal, while passing, from falling into the river. The advantage of this bridge is, that it always swims upon the surface of the water, and is equally passable, whether the water be high or low. To secure this, the wooden bridge extends a good way farther on both sides than the banks of the river when low. At that season it has somewhat the appearance of an inverted catenaria. But when the river is high it is nearly straight.

The inhabitants of Dalecarlia constitute a set of men very different in their habits and appearance from the rest of the Swedes. You see them in considerable numbers in Stockholm, where they undertake the office of porters and labourers, as the Highlanders do in Edinburgh, and the Irish in London. They retain always the peculiar dress of their country, which it is said has undergone no change since the time of Gustavus Vasa. The men wear long whitish grey coarse coats, with buttons seemingly of horn or leather, and in shape somewhat similar to the English jockey coat, but more clumsily made. They wear a thong of leather by way of girdle. Their hats have somewhat the appearance of those which our quakers wear. In short, the Dalecarlians may be considered as the Quakers of Sweden. In the northern parts of the

province, they use a dialect of their own, somewhat similar to the English, or rather to that dialect of English, which is spoken in the lowlands of Scotland. It is reported that a Dalecarlian, who spoke this dialect, being landed near Aberdeen, was understood by the inhabitants of Scotland. They use the letter *w* as we do, and many of their words are pretty similar to ours. Thus instead of *vatter*, which is the Swedish word for *water*, they say *watter*. Not having been in the part of Dalecarlia where this dialect is spoken, I had no opportunity of judging whether it was intelligible to a person from Scotland. But my information was derived from Mr. Tode, a Swedish merchant, one of the best informed men that I met with in Sweden, and who spoke English exceedingly well.

The military character of the Dalecarlians stands very high. They first rose to eminence during the struggles of Gustavus Vasa, who was enabled by their means to shake off the Danish yoke, and vindicate the liberty of his country. This military character they have preserved ever since, and have more than once exerted it for the deliverance of their country. When Gustavus III. found himself hard pressed by the Russians, he repaired to Dalecarlia, called together the inhabitants of the province, and prevailed upon them to march in a body to his relief. When Gustavus IV. was in a still more deplorable situation than his father had been, he thought of the same means of extricating himself: and accordingly called together the inhabitants of Dalecarlia. But this mistaken prince, being acquainted with no other means of obtaining what he wanted but force, instead of endeavouring to persuade, or to excite compassion, issued his peremptory orders for them to march. The province was irritated, they claimed the exemption from all such necessity given them by his father, and absolutely refused to obey. The regiment of Dalecarlia bears nearly the same character in the Swedish army that the 42d regiment does in the British.

The province of Dalecarlia is of considerable size, extending from a little southward of the river Dal, which is somewhat beyond the 60th degree of north latitude to nearly the 62d degree. From east to west, if we allow it to extend to the Gulf of Bothnia, it stretches over about

five degrees of longitude. It is finely variegated with hill and dale, and indeed takes its name from this circumstance: Dalarne, by which appellation it is known in Sweden, signifying *the valleys*. It is not nearly so much covered with wood as most of the other provinces of Sweden, at least those parts of it which I saw; and this adds very materially to its beauty. For nothing appears more dull or tiresome, when you have been accustomed to it for some time, than a continued pine-forest, excluding every possibility of a view, and exhibiting nothing to the eye but its own dark and dismal green. Like all the other provinces of Sweden, it is checquered with a variety of lakes of different sizes, and it contains two rivers (besides many streamlets) which in such a country as Sweden, where great rivers are not to be found, acquire some importance. These are the Dal, which occupies the southern part of the province, and though a shallow and slow running river, and therefore not containing a very great deal of water, is yet broad, and has a respectable appearance. When I state that at first sight I mistook what I saw of it for a portion of a lake, it follows that its breadth must be pretty considerable. The other river is the Ljusne, which occupies the northern part of the province, and is about the same size as the Dal. Both of these rivers, I conceive, as they approach the Gulf of Bothnia into which they fall, make their way through a number of small lakes, which add greatly to their apparent breadth. Both of these rivers originate from the high mountainous tract which separates Sweden from Norway, about the latitude of Drontheim, and a little to the south. There is another pretty considerable river which rises in the same tract, runs south through Vermeland, and empties itself into the Venner. This river is the Clara.

Except the southern part of the province in the neighbourhood of the Dal, and as far north as Fahlun, the whole of Dalecarlia may be said to be mountainous. But the mountains vary greatly in height. The highest are in the neighbourhood of Norway. The mountain Fjäll, for example, which lies in the parishes of Lima and Särna, bordering upon Norway, rises above those limits within which trees and the larger vegetables grow, and cannot be less than 3000 feet in

height. It constitutes a part of the great northern chain of mountains known in this country by the name of the Doffrine hills, which separate Sweden from Norway. But by far the greatest part of the hills of which Dalecarlia is composed are of a much smaller size, and are rather entitled to the name of round-backed knolls than mountains. Their summits are usually covered with pine-forests. But it is proper here to state, that I did not travel so far north as the boundary of the province in that direction, and that my knowledge of Dalecarlia, in the neighbourhood of and beyond the river Ljusne, is derived entirely from the information of others, and particularly from the account of Hisinger, in his *Mineral Geography of Sweden.*

From the great chain of mountains which separate Sweden from Norway, just about the place where the mountain Fjäll stands, there arise two subordinate chains of hills, which run through Sweden in a south easterly direction, gradually diminishing as they proceed, both in height and magnitude. The farthest north of these chains runs through the northern parts of Dalecarlia, and separates Dalecarlia, properly so called, from Herjeodal, Helsingland, and Gestrickland, becoming at last so low that it requires some attention to perceive it. The other chain, which is farthest to the south, runs between Dalecarlia and Vermeland; then taking a southern direction and becoming exceedingly low, it crosses the whole of Nerike and part of West Gothland, and terminates at the northern extremity of the lake Vetter: or perhaps we may rather say that it continues along the east side of that lake till a little on the south side of Iönköping in Smoland, from which point one ridge runs west to Gottenburg, and another east towards the Baltic at Kalmar. This description gives a general view of all the hilly tract of South Sweden, except a low ridge which runs east and west from sea to sea, at the southern extremity of Smoland, where the peninsula becomes narrow. The reader would form a very erroneous idea of these hills, if he were to compare them with the ranges of mountains in Scotland, Wales, or the north of England. In the greatest part of their extent they are not so conspicuous as Highgate, Hampstead, and Harrow upon the north side of London. When the

country is covered with wood, and your view interrupted, you may travel for hundreds of miles, and cross these hills in all directions without being aware of their existence, any farther than that you are drawn occasionally up a slight ascent, or descend into a hollow.

The structure of Dalecarlia varies a good deal: the greatest part of it indeed is primitive, but it contains likewise a considerable tract of floetz country. On that account it will be necessary to be somewhat particular in the description of it, in order to enable the mineralogist to form to himself a true picture of the constitution of this interesting province.

The province of Dalecarlia, as far as I myself examined it, is entirely primitive, consisting partly of gneiss, and partly of beds of felspar, &c. which appear to be subordinate to the gneiss. But unfortunately I did not go to Elfdal, where the porphyry quarries exist, not being aware at the time of the remarkable peculiarity of structure which distinguishes that spot. An account of it was published in the Memoirs of the Stockholm Academy of Sciences in the year 1805, by Mr. Hjelm, who examined the spot with care. This gentleman is noted for his accuracy, and having made mineralogy the study of his whole life, his opinion is entitled to considerable attention. As far as I could perceive from the conversations that I had with him, he does not seem to have paid much attention to geognosy. But as he was well acquainted with the appearance of rocks, and able to distinguish them by their names, this circumstance is not sufficient to destroy his evidence. Hisinger likewise in his Mineral Geography of Sweden, gives a similar account. Now he has paid more attention to geognosy than any other person in Sweden, and has drawn up his book according to the Wernerian principles, and has prefixed to it an introduction, in which he gives an arrangement of rocks, not indeed the same as Werner has given, but somewhat modified. And the porphyritic tract of country in Dalecarlia seems to have been the cause of his modification. He classes conglomerate, sandstone, newer porphyry, and alum-slate, among the transition rocks. I saw abundance of specimens of the porphyry of Elfdal in Stockholm and other places, all of them indeed

in a polished state, but their composition was sufficiently evident. The basis was usually felspar, or sometimes clay stone, and the crystals, which superabounded in it, and from which it derived in a great measure its beauty, were chiefly of felspar, but sometimes likewise of quartz. In some specimens I observed hornblende crystals, which gave the specimen the appearance of sienite.

Now the structure of this rock, which extends over a considerable tract of country, is said to be this. The lowest bed of all is sandstone, containing petrifactions. Over this lies a very thick bed of porphyry: over this a bed of a kind of coarse porphyry, to which the Swedes give the name of porphyry breccia. Lastly, the summit of the rock consists of a thick bed of greenstone. I have given a representation of the structure of this curious rock in Plate XIII. figure 5. As I did not myself examine this rock, I cannot authenticate the preceding account from my own testimony. But from the high opinion I entertain of the accuracy of Mr. Hjelm, and the pains which he took to ascertain the point, I have no doubt of the correctness of the account which I have given. It shows the inaccuracy of the Wernerian classification of rocks in two particulars. First, in confining porphyry to the primitive rocks, whereas there can be no doubt that it exists also in the transition rocks. Indeed I have little doubt that it will be found even in floetz rocks. Every mineralogist must have observed greenstone occasionally putting on a porphyritic appearance. The other particular in which the Wernerian classification of rocks is corrected by the structure of the rocks in Elfdal, is, that *gray wacke* is not the only sandstone which occurs among the transition rocks. For the sandstone at Elfdal has no resemblance whatever to gray wacke. It is, I am told, a hard white sandstone, consisting chiefly of grains of quartz.

The petrifactions which this sandstone contains demonstrate that it cannot belong to the primitive rocks. I received a list of these petrifactions from a friend in Sweden, but I dare not venture to insert them here, because I am not absolutely sure whether they were found in the sandstone immediately under the porphyry, or at some distance. The absence of fragments of clay-slate in this sandstone proves that it

does not belong to gray wacke. Perhaps it may be thought by some that the whole suite of rocks in this plan belong to the floetz class of rocks, and not to the transition. This is certainly an opinion that may be taken up. There is nothing to lead us to place these beds among the transition rocks but the porphyry, which constitutes the most conspicuous and important of them. This surely of itself is not a sufficient reason. It appears to me much more reasonable to be determined by the sandstone which has hitherto been considered as characterising the floetz rocks. If we adopt this opinion, which appears to me by far the most rational, it will follow that the rocks of Elfdal only point out one mistake in the Wernerian classification of rocks,—the confining porphyry to primitive rocks; whereas in fact it extends over all the three formations of primitive, transition, and floetz. We must expect to find various other modifications in the Wernerian classification besides this, as we proceed in the difficult but important task of examining the structure of the surface of the earth with rigid accuracy, regardless of all preconceived opinions, and anxious only to discover the truth.

Elfdal, famous for its porphyry quarries, lies a little to the east side of the river Dal, a little to the north of the lake Siljar, through which the river Dal runs. The quarry lies rather farther north than latitude 61°. Very large blocks of porphyry are raised from this quarry, and afterwards hewn into the wished for shape, and then polished. In this state it has a very great degree of beauty, while it is so hard as not to be liable to be injured by the weather. The pedestal of the statue of Gustavus III. in Stockholm, and many other exquisitely beautiful ornaments with which that capital is adorned, are constructed of this porphyry. It is made likewise into candlesticks, vases, paint boxes, and a variety of other utensils; and these are exposed to sale in Stockholm, and are under the care of Mr. Hjelm, who sells them. Perhaps this porphyry work may be styled, without impropriety, the most complete manufactory in Sweden.

Not considering myself entitled, from the small portion of Dalecarlia which I traversed, to give an account of its geognostic structure, and

at the same time being unwilling to omit so interesting a province, I shall introduce into this place the description of it, given by Hisinger in his *Mineral Geography of Sweden.* But to make this description intelligible to the mineralogists of this country, it will be necessary to give a previous table of his classification of rocks: this classification is as follows:

I. PRIMITIVE ROCKS.

1 Granite.
2 Gneiss.
3 Mica slate.
4 Clay slate.
5 Chlorite slate.
6 Porphyry; usually felspar and hornstone porphyry.
7 Primitive lime.
8 Serpentine.
9 Quartz.
10 Primitive trap.
- 1 Hornblende.
- 2 Primitive greenstone.
- 3 Porphyry trap.

II. TRANSITION ROCKS.

1 Conglomerate and sandstone. This sandstone is much harder than floetz sandstone. Its cement is quartz. It seldom contains petrifactions.
2 Transition porphyry.
3 Transition clay slate and alum slate.
4 Transition limestone.
- Marl slate.
- Oolite and pisolite.

Transition trap.
- 1 Greenstone.
- 2 Greenstone porphyry.
- 3 Green porphyry.

III. FLOETZ ROCKS.

1 Floetz sandstone.
2 Coal.
3 Floetz limestone.
4 Chalk.

IV. ALLUVIAL ROCKS.

These, hardly entitled to the name of rocks, it is needless to particularise.

The preceding sketch will enable the mineralogical reader to form a pretty correct estimate of the state of geognosy in Sweden; for Hisinger is one of those who has paid more attention to the subject than almost any other of his countrymen. We need not be surprised at the imperfect state in which the floetz formations appear in the preceding table. Sweden being chiefly primitive, but few opportunities occur to study them. He might, however, at Helsingburg have made out the greater part of the beds which characterise the independent coal formation.

We shall now be able to understand Hisinger's account of Dalecarlia, which is as follows:

In the south and south-east part of the province, in the parishes of Rättoiks, Mora, Venjans, and Malungo, the rocks consist of the same species which are found in other parts of Sweden at a similar height; namely, red and grey granite, (gneiss) mica slate, primitive limestone, and sometimes, though rarely, primitive trap. In the north and north-west portions of the same parishes, we find these covered by beds of rocks, which belong chiefly to the transition class. These consist of gravel, conglomerate, hard flinty alpine sandstone, over which for a considerable extent lie hälleflinta* and jaspar porphyry, transition greenstone, greenstone porphyry, porphyry breccia, and transition clay slate; all lying in beds which approach more or less to the horizontal position. A conglomerate, consisting of sandstone breccia,

* This word, used by Cronstedt, is applied in Sweden to quartz, hornstone, and compact felspar. The porphyry alluded to is felspar and clay porphyry.

and breccia saxosa, lies over this alpine chain of rocks in the Svackufjäll, Elgshognan, Salfjäll, Mossevola, &c. which lie partly in Sweden and partly in Norway. Farther down, in the parish of Särn, is found alpine sandstone. Over this, in the parish of Elfvedal, within the division of eastern Dalelf, there is an extensive tract of transition porphyry, porphyry breccia, and transition greenstone, which continues over a part of the parishes of Mora and Orssa. Round western Dalelf, in the parish of Lima, are found alpine sandstone, clay slate, trap, and trap porphyry, all belonging to the transition rocks.

In the parishes of Rättvik, Ore, Orssa, Mora, and Sophia Magdalena, there occur beds of transition rocks, consisting of sandstone, limestone, clay slate, and marl slate, interspersed with petrifactions, and of posterior formation to the preceding rocks, which they in part cover. Respecting this tract the following observations may be made.

1. The aspect of the surface is usually uneven, some few plains excepted, as for example, the sandy plain between Rättvik and Boda chapel; that between Dalby and Furndal, in the parish of Ore; the plain of Skatunge and the north part of Sollerön. The beds of limestone at Vika and Vomhus, in the parish of Mora, are likewise disposed into plains. Finally the surface is broken into alternate heights and valleys, the beds of which either constitute oblong or level ridges, as those about Boda and Osmundsberg; or they fill up hollows and precipices consisting of older rocks, the flanks of which, to a greater or smaller extent, consist of these beds. This is the case at Digerberg, in Orssa by Skatunge chapel, and at a height between Vikarby and the church of Rättvik, &c.

The heights round the lakes of Siljan and Orssa are very low: at Vomhus, Vika, Omon, near Sollerön, and at the foot of Digerberg, they lie almost on a level with the surface of the water, and probably constitute the bottom of the lake Orssa. On the other hand, at Glekärna in Rättvik, they occur, according to Cronstedt,* nearly 200 fa-

* Mineral historia öfver en del af Westmonland och Dalarne, 1752, MS. in the Archives of the College of Mines.

thoms above the surface of the lake Siljan, and at Osmundsberg they are still higher.

The boundaries and circumferences of the different beds can hardly be ascertained with accuracy, on account of the forests and alluvial earth with which they are covered. That part of the lake Siljan which is called Rättvik is surrounded with beds of limestone, which lie over rocks of granite and mica slate, from Osbäck five-eighths of a Swedish mile south from Rättvik church, to Icke-on in the same parish. From Rättvik these beds are continued in a north-easterly direction to Boda chapel, and they may be seen still farther north in the parish of Ore. They are found likewise in Rättvik near Beäckby, Alsorby, Kyrkan, Yikarby, Öiga, Östbjörka, and the village of Gliskärna. A good many other localities are here given by Hisinger, but as they are of small value to the English reader, and throw but little light on the structure of the country, I do not consider it as necessary to transcribe them.

Beds of limestone are found likewise in the parish of Mora, by Vomelf and Vomhus chapel, and near the village of Vika and Selbäcks. The beds found at Vika are a continuation of those at Sollerön.

Sollerön parish and that of Sophia Magdalena consist for the most part of a flat round height of red granite (gneiss), which towards the north and north-west sinks into a level plain. Over the lower side of this height passes transversely a bed of limestone, and a little to the north of it at Utanmyra sandstone occurs.

The curvilinear extent of this bed from Rättvik near Boda, Ore, Skaturgby, and Orssa to Vattnäs in Mora, amounts to about 7 Swedish, or 46$\frac{2}{3}$ English miles. Its breadth may be estimated at about a mile (6$\frac{2}{3}$ English miles); but this breadth varies considerably in different places.

2. Sandstone and limestone, which sometimes contains posterior beds of clay slate and marl slate, intermixed and composed of the substances that have been named in the preceding table of the transition rocks.

The sandstone in this tract, as is the case with the same rock in other parts of the kingdom, constitutes always the lowest bed. Beds

of it with limestone are seen at Sollerön, near the grindstone quarry in Orssa, a quarter of a mile ($1\frac{2}{3}$ English mile) from Dalby in Ore, and in a variety of other places, which I do not conceive it to be necessary to transcribe. These beds dip to the north-north-west and north, at an angle of between 30 and 40 degrees; while the limestone dips to the west at an angle of about 49 degrees. At Styggforss in Boda the sandstone beds lie immediately over the primitive rocks, and are accompanied by marl slate and limestone. At Sollerön and by Vikarby limestone beds are likewise found lying immediately over granite. But this is explained by considering, that though limestone be of posterior formation to the sandstone, yet, as it is much more extensive, it must in some places extend beyond the bounds of the sandstone, and of course be deposited immediately over the primitive rocks.

Limestone, with intermingled beds of clay slate and marl slate, constitute the uppermost bed. The clay slate and marl slate are found only in the upright beds, surrounded by the common limestone, to which the strata are parallel, though the beds are not particularly level. Examples of this may be seen on the north-west side of the cliff of Osmundsberg, at Styggforss, at Skatungbyn, in the enclosure near the river Ore, where layers of thin slaty clay slate, running east and west, and dipping at an angle of 23 degrees to the north, are surrounded with parallel beds of limestone. By Vikarby in Rättvik, the whole height upon which the village is situated, rising gradually from Siljan, consists of beds of limestone running in an east-north-east and west-south-west direction, and dipping at an angle of 25 degrees towards the north-north-west. Near a small wind-mill in the same place occurs a bed of grey clay slate 22 feet thick, running in the same direction, and dipping at a similar angle with the surrounding limestone.

The rocks that lie over these beds are dis-similar both in age and materials. North-east from Siljan, Orssa lake, and Ore river, the covering rocks consist of transition porphyry and trap. About the eighth part of a Swedish mile from the limestone beds, south from the village of Vongsgjärd, on the road to Mora, at the foot of the Digerberg, there is a red conglomerate of quartz and jasper, and beside it a

rock composed of quartz and halleflinta. Farther down about one-eighth of a Swedish mile nearer the north in Mora, there is a compound rock consisting of blackish brown heavy greenstone, and yellowish, reddish, and greenish quartz, with cornelian red lines and streaks; but in consequence of a multitude of rents and cracks, so brittle that it falls to pieces upon the smallest blow. The position of several similar rocks is detailed by Hisinger at some length; but as such statements do not throw any new light upon the structure of the country in general, I omit them.

3. The position of the beds is very various. One half of them retain their primitive position, and are either horizontal or elevated a few degrees by the primitive rocks on which they lie. Others are raised almost to a perpendicular position. At Utanmyra near Sollerön lie sandstone beds nearly in a horizontal position. The same thing occurs at the whetstone quarries between Kalmora and Nederberga. Horizontal beds of limestone are found at Vombus, Vika, Sollerön, Färndal, and Dalby. At Grano they dip north-north-west and north, at an angle of about 10 degrees. On the contrary, there occurs a whole tract of limestone, the beds of which are either perpendicular or incline at an angle at least greater than 40 degrees. This tract is situated between Boda chapel and the hill of Osmund.

The hill of Osmund, half a Swedish mile from Boda, constitutes the highest point of the whole tract. It was described by Tillas in the Memoirs of the Swedish Academy of Sciences for the year 1740. The summit of it is 40 fathoms above the surface of the nearest lake. This hill is composed of the following beds: immediately under the soil, loose brown clay slate (slate clay), 12 feet—coarse grey fuller's earth, 4 feet—dark grey fine clay slate (slate clay), 1 foot—brown limestone, $1\frac{1}{2}$ foot—loose brown clay slate (slate clay), $\frac{1}{2}$ foot—greyish brown limestone, $1\frac{1}{2}$ foot—loose clay slate (slate clay), decrepitating in the fire—compact brown limestone, 1 foot—loose brown clay slate (slate clay), with balls of limestone from an inch to a foot in length, and containing a great deal of petroleum, 2 feet—bituminous limestone, $\frac{1}{2}$ foot—brown clay slate (slate clay), $\frac{1}{2}$ foot—blue clay, containing some silver, 1 inch

—below all these comes the common primitive limestone of the country. Such is Hisinger's description of this hill. There can be no doubt that it belongs to the floetz formations, even from the preceding description, imperfect as it is. I shall omit Hisinger's descriptions of Digerberg, Skatunge, and Styggforss, because they are very long, and do not seem calculated to throw much light on the geognosy of the province.

4. The sandstone is composed of fine siliceous matter mixed with oxide of iron and clay, and often contains some lime. The varieties of it are as follows:

Light grey fine grained sandstone, varying in colour from white to dark grey, and differing in hardness. Found at Kallmora, Styggforss, Sollerön.

Light grey sandstone with streaks of red iron shot clay. Kallmora.

Pale red fine grained sandstone, lighter and darker coloured. Kallmora, Galleros.

Pale red fine grained sandstone, with round white spots. Styggforss, Karfsos.

The limestone exhibits the following varieties.

Compact limestone, sometimes grey, sometimes reddish brown, in distinct beds; the former with green spots, the latter with green and yellow veins.

Limestone with a splintery fracture, translucent, reddish, yellow, and white, with cavities filled with calcareous spar, stalactites and petroleum. At Dalby lime quarry.

Grey and reddish limestone mixed with sand. The hill near Rattvik's church.

Red and white lumachella with small white anomiæ and entrochi, in reddish brown limestone. At Karfsos.

Calcareous spar. At Gliskärna, Forndal, &c.

Grey and red marl slate. At Styggforss.

The petrifactions found in this limestone are orthoceratites, entomolithus paradoxus, ammonites, anomia pecten, turbinites, Nerites, small anomias with entrochites, &c.

Such is the structure of Dalecarlia, as far as it is described by Hisinger. Imperfect and unsatisfactory as his account is, I think we may infer from it without much hesitation, that the basis of Dalecarlia consists of primitive rocks; but that the greatest part of the surface consists of floetz rocks, especially sandstone and limestone, containing the usual petrifactions, which distinguish floetz limestone. We may conclude likewise that the porphyry, which sometimes alternates with these rocks, belongs also to the floetz formation. From any thing that appears in Hisinger's description of the country there is no reason to conclude that any transition rocks have hitherto been observed in Dalecarlia. The reader will be apt to accuse me of culpable negligence in not determining the structure of this country by actual inspection. But Dalecarlia is of such extent, its rocks are so imperfectly exposed to view, and they vary so much in their nature, that a very long period would have been requisite to determine so difficult a point in a satisfactory manner; much longer than the entire period which it was in my power to allot to the investigation of the whole country.

# CHAPTER XII.

## ACCOUNT OF FAHLUN.

Description of the Town—Account of the Copper Mine—Manufacture of Copperas—Sulphur Work—Rocks on the Plain—Surrounding Rocks—Rock in which the Mine is situated—History of the Mine—Method of Smelting—Assessor I. G. Gahn—Mr. Järta—Cabinet of Minerals—Minerals of Fahlun—Garnets—Octahedral Iron Ore—Automalite—Fahlunite—Pyrophysalite—Gadolinite—Tin—Sahlite—New Mineral.

THE town of Fahlun owes its existence to the copper mine in its neighbourhood, which is one of the oldest, and was for many years the greatest in Sweden. It lies nearly in north latitude 60° 35′. Like all the Swedish towns, it is very regular, consisting of several parallel streets, crossed at right angles by a number of others. There are two churches in the town, one of which is covered with copper. Till I saw edifices covered both with iron and copper I was of opinion that the latter metal was much better fitted for that purpose, and would look much more handsome on a roof than the former. But in reality the reverse is the case. The copper soon becomes of a dirty whitish green, and this colour being in itself disagreeable, and very unequally laid on, gives the whole an unhandsome appearance, whereas the iron becomes of a very equal reddish brown colour throughout, and continues to look exceedingly well. Such a roof lasts a long time, and is very secure. I wonder it has never been tried in this country, where iron is so abundant, and so cheap.

Fahlun lies in a small plain surrounded on all sides by low hills. It is rather more than 300 feet higher than the surface of the sea. It has several lakes in its neighbourhood, and there is abundance of water for all the purposes of the mine. This water is collected in small lakes, and is let down in rills of the requisite size for the different purposes of machinery and washing the ore. There is likewise a small river which passes through the town, or rather upon the north side of it, running in a south easterly direction, till it falls into the Dal. From the great quantity of ore usually roasted in the neighbourhood of the town it was formerly enveloped in a perpetual cloud of smoke; but of late years this has very much diminished with the quantity of ore extracted from the mine. Prodigious masses of scoriæ lie all about. The older scoriæ have been but imperfectly deprived of the copper which they contained.

The mine of copper ore at Fahlun consisted of an immense cone of copper and iron pyrites placed with its apex downwards. It has been wrought from time immemorial, and formerly with so little care, that about 150 years ago the whole works fell in, leaving a great hollow, still very conspicuous as we approach the mine. Two large pillars, or rather hills, of quartz, however, remained unmoved amidst the ruins. They may be still seen rising through the bottom of the great excavation formed by the tumbling in of the mine. For many years galleries were driven through the old works, and the ore extracted in that manner; but now the vast heap of ruins has been wrought out, and they are obliged to go deeper for the ore which at present they extract. The mine is about 200 fathoms deep. The descent is by an easy winding staircase all the way; so that you may descend to the bottom without any other inconvenience than the fatigue of going down so many steps. The galleries are all spacious: none less than 8 feet in height, and some as high as 30 feet. There are about 600 workmen in the mine. The ore is extracted partly by the mallet, partly blasted by gunpowder. It is extremely poor, seldom yielding more than $1\frac{1}{2}$ per cent. of copper. To the eye, indeed, it has nearly the appearance

of iron pyrites. This pyrites is very frequently mixed with beautiful crystals of actinolite, of considerable quantity, which gives it, when fresh broken, a very splendid appearance. This actinolite is likewise found in the neighbourhood in chlorite slate, crystallized in very regular four-sided prisms, about an inch in length, and having a greyish blue colour.

Whether the original great conical mass of ore constituted a vein or not, it is impossible to say; all means of tracing any thing respecting its situation having been long ago destroyed. But several veins filled with a similar ore still exist, and have been wrought. This will be best seen by the two maps of the Fahlun mine which accompany this chapter. They are copied from a very accurate set of charts of this mine, constructed by Baron Hermelin. I compared them with the mine on the spot, and thus was enabled, in some measure, to judge of their accuracy. The first of these maps represents the surface of the ground over the mine and its environs. I shall give an explanation of the references in it at the end of this chapter.

The second map, given in plate 10, represents a perpendicular section of the mine from east to west, through King Adolphus Frederick's shaft, and from south-east to north-west by Queen Louisa Ulrica's shaft, which shews the union of Prince Gustavus and Liljenberg veins, where the contents of the Stora Grufva terminate. An explanation of the references contained in this section will also be found at the end of the chapter.

The ore is drawn up the perpendicular shafts. The principal one of which, King Adolphus Frederick's shaft, is seen in the perpendicular section of the mine, plate 10. All the machinery belonging to this mine is driven by water; and as far as my observations went, the whole is constructed according to very scientific and sound principles.

The whole wood-work of the mine is impregnated with sulphate of iron. The water that collects in the mine contains likewise a portion of the same salt in solution. As this water contains likewise a little sulphate of copper, it is pumped up, and made to run slowly

through a pretty long trough, containing pieces of old iron. By this contrivance the copper is precipitated. It is collected occasionally, and smelted. The water, thus freed from copper, though it contains sulphate of iron, is by much too weak to render it profitable to crystallize the salt by means of heat. It is concentrated by a very ingenious method, borrowed from the method used in Germany to concentrate some of their weak salt brines. The water is pumped up to the top of a pretty high wooden stage, all wrapt round with birch twigs. It is let fall upon these twigs, and trickles over them to a trough, at the bottom of the stage, prepared to receive it: by this contrivance a very great surface of the liquid is exposed to the air, which greatly facilitates its evaporation. This process is repeated seven times, as the liquid moves along from one extremity of the stage to the other. By this time it is so much concentrated, as not to be very far from the point of crystallization. From this stage it runs into a large vessel lined with lead, where it is sufficiently concentrated by boiling. It is then let into a number of small square wooden vessels, set beside each other in a large apartment for the purpose. Into each of these vessels a number of wooden rods, fixed to a frame, is dipped. Upon these rods the sulphate of iron crystallizes. The copperas thus manufactured is used in Sweden, and exported to different ports in the Baltic. The manufacture, unless I misunderstood the workmen, belongs to Assessor Gahn.

Assessor Gahn has likewise a very simple apparatus for distilling the iron pyrites, and obtaining the sulphur. It consists of a long wooden box, laid along the ground, which serves the purpose of a flue to the furnace, or still, in which the pyrites is roasted. The sulphur is deposited in this wooden box, the top of which may be lifted off at pleasure, and the sulphur swept out. It is again melted, and cast into rolls. Sulphur obtained by this means is never quite pure, usually containing one or more of the very volatile metals, and sometimes traces of copper, and very frequently of iron. Its colour is always pale, and not so beautiful as that of flower of sulphur.

The whole surface of the plain on which the mine is situated is thick

strewed with immense round blocks of granite, quartz, felspar, hornblende, and chlorite slate. But not a single rock is to be seen *in sitû* in the whole plain, except the two pyramids of quartz, in the excavation of the mine, formerly mentioned. But upon the higher grounds which surround Fahlun, especially to the west, rocks will be found exposed in considerable quantity. They are seldom much elevated above the surface of the ground. However, after a good deal of laborious research, I succeeded in satisfying myself that the rock which environs Fahlun is a particular kind of felspar, without exhibiting any quartz or mica which I was able to detect, though I pursued the course of the rock several miles. This rock is very much injured by the weather. I could not perceive any marks of stratification in it; but as the direction of the high ground is from south to north, that is the direction in which only it can be traced. I observed three great veins of hornblende cutting through this rock, and running in an easterly and westerly direction. In one of these veins there was a bed of quartz eight inches thick. Each of the hornblende veins must have been at least six feet thick. I observed likewise several veins of quartz not exceeding a few inches in thickness, running in the same direction with the hornblende veins.

The rocks on the east side of the mine, at the distance of some miles, are gneiss. From the minerals that accompany the copper ore, such as actinolite, tremolite, chlorite, and from several other circumstances, I have little doubt that the mine consists, in fact, of a series of veins in mica slate. The vein stones appear to consist chiefly of quartz. At the same time, from the exhausted state of the mine, the prodigious accumulation of debris on all sides, the tumbling in of the old mine, and the difficulty of finding the rock *in sitû*, within any reasonable distance of the mine, it is no easy matter to ascertain the point with accuracy. Some years ago, before the present accumulations took place, the determination was probably attended with much less difficulty than at present.

Fahlun is the oldest, and for many years it was the most productive mine in Sweden. It is known to have been wrought since the year

1347. Nor is there any reason to believe the working of it began only then, though no authentic records go to a greater antiquity. In the year 1600, it yielded annually about eight millions of pounds of copper in the year. But for some time back the produce has been greatly diminished, and there is every reason to expect that no great number of years will elapse before it ceases altogether to be productive. Those gentlemen who have the management of the mine are sensible of this circumstance, and have been turning their attention to the iron mines in the neighbourhood, as a means of employing the workmen, when the copper mine shall be exhausted. The Governor of the province, who is himself possessed of some iron mines, and who conceives that the interference of these gentlemen would be injurious to his trade, has endeavoured to prevent them from carrying their views into execution. The consequence has been a law-suit, which is not yet decided; though it is not easy to conceive upon what principle the Governor of the province can hope to be able to prevent other people from working iron mines.

The copper mine of Fahlun is at present the property of a considerable number of individuals. When the ore is brought to the surface of the earth, it is divided into different portions according to the requisite shares of each individual. Every one is at liberty, either to smelt his own ore in the way he thinks proper, or to dispose of it to those who are inclined to purchase it. From this method of proceeding it happens that there are a great many different smelting-houses, and that each house conducts its processes upon a small and economical scale.

The first part of the process consists in roasting the ore in the open air, in order to get rid of the sulphur with which it is combined. The ore is then mixed with charcoal, and melted in a blast furnace, blown by a couple of bellows, driven by water. By this means a great proportion of the iron is got rid of. The produce of this furnace is now roasted four or five times in succession, not in the open air but in shades, and the fire is kept purposely low to prevent the ore from melting. When this roasting is carried far enough, the ore is melted again in a blast furnace, and the scoriæ separated. By this

second smelting the copper is obtained nearly in a state of purity. It is now melted a second time, and cast into bars. This process is very simple and economical, and at the same time very effectual. It seems to me to have the advantage over the methods employed to reduce the same kind of copper ore in Anglesey; but perhaps it is not exactly suited to the kind of fuel employed in our smelting houses, nor to the great scale in which our reduction of copper ore is conducted. There can be little doubt that as much copper is obtained from the mines of Great Britain alone, as from all the rest of Europe put together. Anglesey and Cornwall are the great depots of this kind of ore, though it is found likewise in other parts of the kingdom.

I carried with me to Fahlun two introductory letters to Assessor J. Gottlieb Gahn, who has for many years resided in that town, has several manufactures in it, and is also one of the proprietors of the copper. He is a man of about 68 years of age, of exceedingly pleasing manners, accompanied with uncommon frankness and simplicity of character. I was not a little confounded to find, in so remote a situation as Fahlun, a man of sixty-eight familiarly acquainted with all the latest discoveries in every branch of science: an excellent mechanic, who has supplied himself with accurate philosophical instruments of every kind; but who has not, as is too often the case with practical mechanics, devoted the whole of his time to such pursuits; on the contrary, he is an accurate experimenter, and a very assiduous cultivator both of chemistry and of some other branches of science. He exhibited to me some of the curious discoveries of Malus respecting light. His chemical apparatus is extremely neat and very convenient, and he has a variety of platinum utensils, which he has constructed from bars of that metal brought from Spain, France, and Great Britain. Perhaps it would not be bestowing too high a compliment on Mr. Gahn, if I were to say that he possesses the greatest quantity of general information of any man in Sweden. Nor are the frankness and affability of his manners inferior to his knowledge. I have seldom met with any person with whom I was more delighted. He had been the intimate friend of Scheele, and showed me a volume of his letters written in the Ger-

man language, which he had bound up, and which he deservedly reckoned a very valuable and curious document. These letters all related to chemistry, and contained the history of some of Scheele's most curious discoveries.

Gahn was likewise the intimate friend of Bergman, and he showed me a cast of him in plaster of Paris, which he said was an excellent likeness. Of Scheele, it does not appear that any figure whatever has been preserved: he was in too poor circumstances, and during his life time made not a sufficiently conspicuous figure, to render such a picture an object while he lived. As a compensation for this insignificance during his life-time, he will make a much greater figure in the history of chemistry than any one of his countrymen without exception, whether we choose to consider him as a German or a Swede.

Gahn's two great discoveries were the constituents of the earth of bones, which he ascertained to consist chiefly of phosphate of lime; and the reduction of the ore of manganese to the metallic state. This last discovery was the consequence of a set of experiments made at the request of Bergman, who had suspected from his own observations, and the experiments of Scheele, that the base of the substance, at that time known by the name of manganese, is a metal. Since that period very few additions have been made to the facts determined by Gahn, till Dr. John published his experiments on the subject about four years ago.

I ought not to neglect to mention Mr. Gahn, jun. the son of Assessor Gahn, who accompanied us through the mine, and showed us all the different manufactures and mechanical contrivances that were to be seen about the mine. On Sunday the 13th September, my fellow traveller, who was under the necessity of being in Edinburgh by the end of the month, set out for Gottenburg, and I saw him no more till I met with him again in Edinburgh in the month of November. I dined with Assessor Gahn and his family, on Sunday, at two o'clock, which is the Swedish hour of dining. Among the company I met a gentleman who spoke French with great fluency, and whose manners and behaviour led me to pay some attention to him. I afterwards got

the following account of him. His name was Mr. Järta, he was born a baron; but about twelve years ago, in a fit of enthusiasm for the cause of liberty, he threw up his title at a meeting of the Diet, and this renunciation of nobility was afterwards confirmed by the King. After the late revolution, his great and well known abilities induced his countrymen to raise him to the office of Secretary of State; but his violent temper did not suit him well for the opposition which he encountered from his colleagues in office. At last, when the Swedes declared war against Great Britain, a measure which he had strenuously opposed, he threw up his situation in disgust, and retired to Fahlun, where he lives upon a very slender income. His abilities are of the highest class, his character excellent; nothing is found fault with but the violence of his temper. What a figure would such a man have made in the British House of Commons. Like the first Earl of Chatham, nothing could have prevented him from rising to the highest situations in the State. But in an aristocracy like Sweden, it is not so much abilities and integrity, as cunning, and address, and family influence, that secure success in the political career.

There is a cabinet of minerals belonging to the Mining Company of Fahlun. It was left by legacy in 1789 to the gold mine of Ädelfors, in Smoland, by Count Nils Bjelke. But that mine ceasing to be wrought about that time, his widow got the will altered, and gave the cabinet of minerals to the Mining Company of Fahlun. I spent about four hours looking over this cabinet. It contains a considerable number of specimens, some of them very fine; but they have not been well preserved. They are in general dirty; nor could I perceive any systematic arrangement in the cabinet. Every thing seems just to have been placed where room could be most conveniently found for it. Such cabinets, if they were properly arranged, and if those young miners, who felt any desire to make themselves acquainted with mineralogy, had free access to them, would be of considerable service to the country. But locked up as they are at present, and open only to the eyes of strangers, who make a visit to Fahlun of a few days, they can hardly be considered as of any use whatever.

Not having written down upon the spot a list of the minerals found at Fahlun and the neighbourhood, but trusting entirely to my collection of these minerals, which I received from Assessor Gahn, and which was very complete, I cannot be expected to give from memory a very accurate detail. But as it would be improper to omit noticing the peculiar minerals of Fahlun in this place, I shall give the best account of them that I can.

1. Large dodecahedral crystals of garnet used formerly to occur abundantly in the mine of Fahlun. They are still found, but in much smaller quantity. Almost all the very large garnet crystals to be seen in the mineral cabinets of Sweden have come from Fahlun. Such crystals, being well known to mineralogists, require no description.

2. Complete octahedral crystals of iron ore, of a considerable size, occasionally occur in the Fahlun mine; but they are scarce, and sell at a comparatively high price. The only way of procuring them is to buy them from the miners, who sometimes make collections of them. I bought some in this way, at the rate of about two shillings sterling each.

3. The mineral called automalite, by Ekeberg, was discovered by Assessor Gahn, in the year 1805. The crystals of it were scattered through a kind of greenish chlorite, which had been taken out of *Eric Matt's mine*. It was immediately analysed by Ekeberg, and the result of his analysis published in 1806, in the first volume of the *Afhandlingar i Fysik, Kemi och Mineralogi Ulgifne af W. Hisinger, och J. Berzelius*. The result of the analysis was curious. The mineral possessed the characters of spinell; but it contained about one-fourth of its weight of zinc. It was this anomaly which induced Ekeberg to invent the term automolite, and apply it to this mineral; as if it were a kind of *deserter* from the order of zinc minerals, to which from its constituents it ought to belong.

I have examined this mineral with a good deal of care, and have little doubt that it is in fact a spinell, containing some sulphuret of zinc, mechanically mixed through it. That the zinc is in reality derived from sulphuret of zinc, is pretty obvious from the result of Vauquelin's

analysis, who obtained 28 parts of oxide of zinc, and nearly 17 parts of sulphur from 100 parts of the mineral. Ekeberg is a very exact experimenter, but not so well qualified to distinguish the appearance of minerals, as his eyes are bad. Hence he might have easily overlooked a mechanical mixture of blende in the crystals. That this should have been overlooked likewise by Vauquelin and Haüy, is not so easily accounted for; unless we suppose that they were not possessed of any great stock of crystals to examine. And we may very well suppose the mixture to be so intimate in some cases as to escape the eye altogether. The crystallization of automalite and spinell are exactly the same. The result of Ekeberg's analysis is as follows:

| | |
|---|---|
| Alumina ..... | 60·00 |
| Oxide of zinc ..... | 24·25 |
| Oxide of iron ..... | 9·25 |
| Silica ..... | 4·75 |
| Manganese and lime ..... | Trace |
| Loss ..... | 1·75 |
| | 100·00 |

There is one objection to considering automalite as a spinell mixed with blende, and I conceive it to be a very formidable one: the specific gravity of automalite is not only considerably greater than that of spinell, but even greater than that of blende itself. One cannot therefore see how it can consist of a mere mixture of the two. And if they be chemically combined, automalite ought to constitute a new species? The colour of the automalite, which is green, does not occur in any variety of spinell that I have ever seen. The magnesia, which seems to constitute an essential constituent of spinell, is wanting in the automalite. These circumstances ought to make us hesitate, and not venture to class the two minerals together till the subject has been farther examined.

Besides in the mine of Fahlun, automalite has been found likewise in the mine of the Nefverberg, and in the mine of Easter Silberg, the first very near Fahlun, the second at the distance of about 27 miles.

4. There is another mineral which occurs likewise in Eric Matt's mine, to which the name of fahlunite has been given. I do not recollect to have seen any description of it given in any mineralogical book, I regret, therefore, that my description from simple recollection must be too imperfect to convey a very accurate picture of the stone. Its colour varies considerably. I have seen it red, green, brown, whitish yellow, and grey. It is sometimes compact, and sometimes crystallized in six-sided prisms: it affects likewise other forms, but I do not recollect them sufficiently for description. Its principal fracture is foliated, its cross fracture splintery. It is translucent on the edges. Its specific gravity is 2·66. It is semihard, and easily scratched by the knife. Before the blow-pipe it melts into a whitish bead, after running through several changes of colour. No analysis of this mineral has hitherto been made; nor has it been ascertained by any competent judge, whether it really ought to constitute a distinct species, or to be joined to some of the species of stony minerals already known.

5. At Finbo, about three miles from Fahlun, there is a quarry. The rock consists chiefly of quartz, though it belongs in fact to the gneiss rocks of the country. About the year 1805, Assessor Gahn discovered in this rock a mineral, which was soon after described by Hisinger, and analysed by Berzelius. The description and analysis was published in the first volume of the Afhandlingar i Fysik, Kemi och Mineralogi, published in 1806. They gave it the name of *pyrophysalite*, from the great number of vesicles which appear in it, when treated before the blow-pipe.

The colour of this mineral is white, sometimes inclining to light green. It is usually crystallized in a kind of irregular rhomboidal prism with angles of 62° and 118°. It is so very full of rifts that complete crystals of it of any considerable size can seldom be obtained. I saw one, however, in the mineralogical cabinet of Upsala. Small sized crystals are not uncommon. It is common likewise to find the crystals of this mineral enveloped in the rock from which they were extracted.

It readily scratches glass, and strikes fire with steel; but is itself

scratched by quartz. It is very difficult to reduce it to powder. Its fragments are sharp-edged, and have no regular form. It is slightly translucent on the edges. Its powder is green; its specific gravity 3·451. Before the blow-pipe it becomes white and opake, and small bubbles cover its surface, which burst when the heat is kept up. It was this circumstance which induced Hisinger and Berzelius to give to this mineral the name of *pyrophysalite.* The powder phosphoresces a little when heated. This mineral according to the analysis of Berzelius, is composed of the following constituents:

| | |
|---|---|
| Alumina ..... | 53·25 |
| Silica ..... | 32·88 |
| Lime ..... | 0·88 |
| Oxide of iron ..... | 0·88 |
| Loss when heated to redness .. | 0·75 |
| Loss during the analysis ..... | 11·36 |
| | 100·00 |

From the phenomena which this mineral exhibits before the blow-pipe, there can be little doubt that the enormous loss is owing to the escape of some volatile acid. Nor can any other acid be suspected except the fluoric. Hence there is every reason to believe that this acid constitutes an ingredient in this mineral. In this respect it resembles topaz and schorlous beryl, both of which contain the same acid. Berzelius points out the resemblance, in his paper on the Analysis of Pyrophysalite. And Haüy, from an ingenious examination and comparison of the crystals, has considered himself entitled to conclude, that pyrophysalite is nothing else than a variety of topaz. There can be no doubt that, as far as chemical analysis goes, the two minerals bear a striking resemblance to each other.

6. In the same quarry at Finbo specimens of gadolinite have been found, several of which I procured by the goodness of Assessor Gahn. This mineral is very scarce, having been hitherto found only in two places of Sweden, Ytterby and Finbo, and in both places in a rock belonging to the species of granite. If the same kind of rock were pro-

perly examined in other countries, there can be little doubt that it would be found. A peculiar earth confined to a peculiar spot, and in very minute quantities, can hardly be conceived. Yet that is the predicament in which three of the earths stand at present, namely, zirconia, yttria, and glucina; while the other six are scattered in great profusion through the rocks constituting the surface of the earth.

7. In the same rock, at Finbo, and often mixed with pyrophysalite, there occur small crystals, which are considered as crystals of oxide of tin. I do not know that they have ever been analysed. The opinion of their nature depends upon their external characters. Perhaps in a mineral so well characterised as tinstone these characters are quite sufficient. But the smallness of the crystals makes it difficult to apply them with precision. Reduction before the blow-pipe upon charcoal, assisted by borax, would be the simplest method of determining the point. I am surprised that it has never been put in practice.

8. Sahlite has been likewise found about 10 miles east from Fahlun, in a copper mine called Björn-Myre-Sveden.

9. Besides these minerals there is still another which, as far as I know, has not yet been described by any person. It has a reddish yellow colour, and a certain degree of resemblance to quartz; but is very different in its properties. Not having been so fortunate as to see this mineral, I cannot undertake to describe it. Specimens of it were sent me by Assessor Gahn, but I have not yet received them.

Besides the mine at Fahlun there are a considerable number of other mines in Dalecarlia. They are chiefly iron and copper mines, with one or two lead mines, to which the Swedes give the name of silver mines, because the galena is rich in silver, and the principal object of the miner is to extract that metal. To this they in some measure sacrifice the lead. Hence it happens, that the lead mines wrought in Sweden are of little consequence in point of emolument; for it is seldom that much profit can arise from merely extracting silver from lead.

*Explanation of the References in Plate* 9, *exhibiting the ground Plan of the Copper Mine at Fahlun, as noticed in page.*218.

A Queen's mine pit.
B Queen's mine shaft.
C Meyenholtz mine.
D John's mine.
E Rolamb's shaft.
F Long mine.
G Cross shaft.
H Drop mine.
I Mordskin's mine.
K Wrede shaft.
L Mons Nils mine pit.
M Wrangel's shaft.
N Great mine pit.
O King Frederick's shaft.
P Tunkarl's mine.
Q King Adolphus Frederick's shaft.
R Krok mine.
S Eric Mols mine.
T Queen Louisa Ulrica's mine.
U Fri shaft.
V Queen Louisa Ulrica's shaft.
X Fahlström's mine.
Y Grufbacke; forsaken.
Z Calmore; forsaken.
a Red ochre work.
b Evaporating work.
c Copperas boiling work.
d Red ochre furnace.
e Copper precipitation work.
f Creat's shaft capstan.
g House where the wheel that raises the water is placed.
h Queen's mine capstan.
i King Frederick's new capstan.
k New capstan house.
l Water courses.
m King Frederick's subterranean wheel-house.
n Dam house.
o Royal sluice.
p King Adolphus Frederick's gallery.
q Dam of water.
r Queen Marg. sluice.
s King Adolphus Frederick's capstan.
t Queen Louisa Ulrica's capstan.
u Water house.
v Washing works.
x Manager's house.
y Wooden planks.
z Mine tavern.
å Hospital.
ä Mine master's house.
ö Common room.
aa Great wooden works of the mine.
bb New ditto.
cc Polishing capstan.
dd Firewood.
ee Nail forge.
ae Mine master's store-house.

PLATE IX

*Perpendicular Section of the* MINE AT FAHLUN

*Explanation of the References in plate* 10, *exhibiting a perpendicular Section of the Copper Mine at Fahlun.*

A Opening of the great mine.
B Mons Nils opening.
C Declivity.
D Charles Gustavus' pit.
E Frederick's gallery.
F King Charles's pit.
G The part of the great mine that tumbled down.
H Björnhol's shaft.
I Tila's gallery.
K The Princess.
L Crown Prince Gustavus' way.
M Prince Charles.
N New air pit.
O Charles's gallery.
P Flott pit.
Q Myrbad gallery.
R Flott.
S The Frigate.
T The Princess; forsaken.
U Prince Frederick Adolphus.
V Hedvik Eliss. Charlotte.
W Mars.
X Prince Gustavus.
Y Crown Prince.
Z Cross gallery mouth.
Å Cross gallery.
Ä Fred's gallery.
Ö Frid's gallery; forsaken.
a Louisa Charlotte.
b Gustavus Adolphus.
c The Victory.
d The Matron.
e The Repose.
f Lionmark.
g Storgarnet.
h Storcrown.
i Where.
k Terra Nova.
l General Adjutant.
m Great Marshall.
n Count Bjelke.
o The Mackarel.
p The Eel.
q The Dolphin.
r The Mountain Lily.
s The Substitute.
t The Fiscal gallery.
u The Flaggon.
w The chain sink.
v The Forge.
x The Hawk pit.
y Ingel John's house.
z Wennerstedt.
å Powder gallery.
ä The Beaver.
ö Troili pit.
*a* Spence gallery.
*b* The Commander.
*c* The Commander's pit.
*d* Glädje gallery.
*e* Count Jacob.
*f* The Wife.
*g* The Count.
*h* The Baronness.
*i* Louisa Ulrica's mine.
*k* Queen Louisa Ulrica's shaft.
*l* The Crown gallery.
*m* Nomage gallery.
*n* Rubin's terrace.
*o* West Kingdom's globe.
*p* Santal gallery.
*q* West Inden's gallery.
*r* The Poplar.
*s* The Guitar.
*t* North Pit gallery.
*u* The Crown Prince.
*w* The Greyling.
*v* The Bishop.
*x* The Glass.
*y* The Consistorium.
*z* The Miner's Hope.
*å* The Brazen Serpent.
*ä* Förlag's gallery.
*ö* Charles Jacob.
1 Prince Gustav's vein mouth.
2 The Representative.
3 The North.
4 The Water-course.

# CHAPTER XIII.

## JOURNEY TO SALA.

Westmanland all Primitive—Lakes diminishing in Size—Account of Sala—Structure of the Country—Mine of Sala in Limestone—Veins that cut the Limestone—Silver extracted—Lead obtained—Number of Miners—Minerals found in Sala Mine—Calcareous Spar—Gypsum—Bitter Spar—Sulphate of Barytes—Mica—Serpentine—Chlorite—Salite—Hornstone—Hornblende—Galena—Amalgam of Silver—Native Antimony—Blende—Mine of Ridderhyttan—Mine of Bastnäs—New Kopperberg.

THE province of Westmanland, as far as I examined it, and I traversed it in two directions, from east to west, and from south to north, is all primitive, and consists chiefly of gneiss. In the west side of the province, the gneiss alternates with mica slate, and contains immense beds of primitive limestone. Primitive green-stone is said also to occur, though I did not myself meet with it. On the south side of the province, there is a considerable number of small eminences running in a northerly and southerly direction, and in the low grounds between each there runs a small rivulet, which bends its course to the Mäler, and serves to feed that lake. These rivulets are all small, on account of the comparative flatness of the country, and to judge from appearances, they are hardly sufficient to keep up the lake to its ancient height. Hence this lake seems to be diminishing; the banks of it are marshy, choked up with vegetables, and quite shallow. The same observation applies to all the lakes in Sweden, which seem to be uni-

formly diminishing in size. I saw evident marks of the action of some of them, a good many feet above their present level.

The most important of the mines in Westmanland is that of Sala, which lies towards the eastern side of the province, not far from the border of Upland. The roads between Fahlun and Sala are in general bad; hilly, sandy, and full of stones. But the country looked beautiful, being finely variegated with hills, woods, lakes, and corn-fields.

The town of Sala, though inferior to Fahlun both in size and elegance, is notwithstanding of some size. Like all the Swedish towns, it has an open square, from which the streets run, with the utmost regularity, in different directions. The church stands at the west end, at some little distance from the town; and there is a small lake upon the north side, round which the road winds. The houses at the south-east end of the town are very mean. The streets are in general wide, but very ill paved. The pavement consists of round stones, of very unequal sizes; and is, in consequence, full of holes, where water is deposited, which makes the streets always wet and dirty. Sala lies in an extensive plain, consisting chiefly of rocks of gneiss, covered by a clayey soil. These rocks are very little elevated above the surface; but sufficiently exposed to ascertain their nature and direction. On the north side of the town they have the character of gneiss, on the south side of granite. Between these two, there runs a bed of primitive limestone, in an easterly and westerly direction. I traced it for about three miles, and probably it extends farther. The breadth of this limestone bed is about half a mile. It is in it that the mine of Sala lies. This limestone is granular, with a shade of green, and possesses a good deal of beauty. It is the common stone employed at Sala for building the walls with which many of the fields are inclosed. It often contains magnesian lime-stone. Magnesian limestone possesses a curious character, by which it may be very readily distinguished from every other species. If you give it a sharp blow with a small hammer, it phosphoresces, and the light continues some time after the stroke, putting you in mind of the cooling of a red-hot

stone, only that the disappearing is much more rapid. This curious property was pointed out to me by Assessor Gahn, at Fahlun.

The mine of Sala lies about an English mile west from the town. Just upon the south side of it, at a distance not greater than one hundred yards, there is a small hill of granite, quite round, and about forty feet in height; the workings have been driven to within a few yards of this hill, but not quite up to it. This hill may be considered as the boundary of the granite on the south side. The limestone comes to its bottom, and the two rocks may be traced in contact, running in a westerly direction, for some miles. I do not mean that the junction is visible all the way. It is often covered over with soil and grass, but every now and then you meet with spots where it is visible, and which enable you to trace the direction in which it runs. The same thing may be said of the junction of the bed of limestone and the gneiss rocks on the north side of the mine and at a distance, which, by estimation, I reckon not quite so great as half an English mile.

In the limestone bed there occur various veins which traverse it from north-west to south-east. The most important of these is a vein of galena, usually mixed with limestone, and occasionally with blende and pyrites. It is this vein which constitutes what is called the silver mine of Sala. There is another vein running parallel to the former, consisting of a mixture of copper pyrites and grey copper ore; but containing by far the greatest quantity of the former. This vein is poor, and of little importance. A third vein, apparently parallel to the two last, is filled with iron, seemingly magnetic iron-stone, mixed with earthy matter, and not very rich in iron. This ore is not wrought. These three veins, which are of most importance in consequence of their metallic nature, are cut by some small veins, which are filled by quartz and by a kind of hornstone, called *flinta* by the Swedes. These cross veins, to which the Swedish miners give the name of skölen, are always very much inclined.

Besides these two kinds of veins in the limestone, there is still a

third vein, which runs nearly from north to south, and cuts through all the other veins in its way. It is consequently the newest of all the veins in the limestone of Sala. This vein is filled with basalt; it is nearly perpendicular to the horizon, and has a considerable thickness. I was much struck with this vein, as it contained the only specimen of basalt which I had met with in Sweden. If it were elevated above the surface, it would resemble the whyndykes, so common on the west coast of Scotland. They usually consist of greenstone, which is a kindred rock to basalt. A vein of basalt in a primitive country, quite flat, and containing no remains of floetz trap in the neighbourhood, will be admitted, I presume, to be an interesting, and rather uncommon object.

What is called the silver mine of Sala is merely the galena contained in the vein first mentioned. It has been wrought above 300 years, and formerly yielded a very considerable quantity of silver. In the year 1506 the annual produce was 32,266 marks, at present I am told the quantity extracted does not exceed 2000. Formerly this mine had been wrought in such an unskilful manner that the whole tumbled down, and a considerable open cavity may be now seen as at Fahlun; not indeed nearly of so large a size, because the scale of the Sala mine is in every respect less. The rock below these debris has been lately examined, but it was not found to contain any ore. After the tumbling in of the mine, that part of it was abandoned altogether, and a new excavation made, a little to the north of the old one. The mine has been sunk to a depth of 150 fathoms, without any appearance of the termination of the vein, and it would be worth while to go still deeper. In all probability, by so doing, the mine might be restored to its former flourishing state. Indeed the present workings are chiefly at the depth of 50 fathoms. You descend into the mine in a bucket, and the machinery for raising and elevating this bucket is very simple and ingenious. It was constructed according to the directions of Mr. Gustavus Billow, the mine-master, who informed me that he took the idea from D'Aubuisson's account of a similar method employed at Freyberg.

The number of workmen employed in the mine of Sala amounts to

100, and the quantity of lead extracted annually amounts to about 32000 lb., if I understood correctly the statement of Mr. Billow. The vein of copper ore is likewise wrought; but the quantity of that metal obtained at Sala is trifling. The vein of iron ore is not wrought at all. The galleries in the mine are all at least six feet high, and some of them very lofty. The water is raised from the mine by means of forcing pumps. There is a considerable stream of water that runs by the mine, sufficient to work all the machinery, the construction of all of which, as far as I observed it, was very well calculated for the objects in view. I do not give any description of the method of washing the ore, of smelting it, and of refining it, in order to extract the silver, because I observed nothing particular in any of these processes, and lead mines are so common in Great Britain, that their processes must be familiar to the greater number of my readers. I thought, however, that the Swedish process was not the best possible for the interest of the proprietors of the mine: the product in lead is too much sacrificed to the product of silver; whereas the lead itself seems to be an object of greater importance than the silver, as far as emolument goes. The mine of Sala was originally a royal mine, but at present it belongs to the town of Sala.

I carried a letter from Assessor Gahn at Fahlun to Mr. Gustavus Billow, the mine-master at Sala, and was received by him in consequence with the greatest politeness and attention. With him I spent the principal part of the day, and he greatly facilitated my examination of the environs by carrying me at once to all the spots best calculated for seeing the structure of the country. He showed me likewise an accurate map of the mine and its environs, which had been constructed from an actual survey, and which served very materially to give me more precise ideas respecting the nature of the mine, and the structure of the country. Mr. Billow had an excellent collection of the minerals peculiar to Sala. This collection I examined with care, and was thereby enabled to form more accurate conclusions respecting the produce of this mine than my short stay would otherwise have enabled me to do. For though I went down into the mine, my labour

was but ill compensated. Mr. Billow was unwell, labouring under a pulmonary complaint, and had been expressly forbidden by his physicians to descend into the mine. My own servant was panic-struck at the idea of descending to such a depth in a bucket, and obstinately refused to venture: I was therefore reduced to the necessity of descending alone without any other companion than a Swede, who did not understand a word of English; so that I was unable to ask any questions, or get an explanation of many things, the reason of which I did not fully understand.

I shall now notice the principal minerals which occur in the mine of Sala, with specimens of almost all of which I was presented by the polite attention of Mr. Billow.

1. By far the most abundant mineral is *granular limestone*, which constitutes the bed in which all the metallic veins occur. It varies in colour; but most commonly is greenish. I was particularly struck with the beauty of this limestone, which was exposed to view in great abundance both at the mouth of the mine and in all the neighbouring fields, where it composed the walls raised for enclosing them. Mixed with lead ore I observed some pieces of calcareous spar; but in no great quantity. It varied in its colour, for I observed specimens white, green, red, and yellow.

2. *Crystals of gypsum* in no great quantity. I did not see any of them *in situ*; but was told that they occurred in the same vein that contained the galena, and that they were found only at a considerable depth. This is a curious circumstance. I am not aware that crystals of sulphate of lime have been observed accompanying galena in any other place.

3. *Bitter spar.* All the specimens that I saw were compact masses without any appearance of crystallization. You may easily detect them by their permanent phosphorescence; a quality which I mentioned before.

4. *Sulphate of barytes.* This mineral occurs in no great quantity. It has a yellowish colour, and is commonly mixed with mountain cork and limestone. Most usually it is compact, though I saw some speci-

mens imperfectly crystallized. From the analysis of Professor Afzelius it appears to be very impure. Two specimens which he analysed were composed as follows:

| | Hintorten. | Stockenström. |
|---|---|---|
| Sulphate of barytes | 79 | 66 |
| Sulphate of lime | 6 | 1.5 |
| Silica | 3 | 10 |
| Alumina and oxide of iron | 4 | 13 |
| Water | 1·5 | 0·5 |
| | 93·5 | 91 |

5. *Mica.* It occurs only in small scales, and in no great quantity.

6. *Serpentine.* It occurs likewise in small quantity. Its usual colours are yellow, and various shades of green.

7. *Chlorite.* In rather greater abundance. Crystals of garnets are found in it.

8. *Salite.* This is a mineral which was first particularised by D'Andrada, who observed it in Sala mine. Since that time it has been observed at Fahlun, and in various other parts of Sweden, and I am informed also in Norway. Haüy remarked the near resemblance which it bore to augite in the form of its crystal, and of late, in consequence of more mature reflection, and a more extensive examination of the crystals of both, he has united it to augite, and considers both as only constituting one species. However, the difference between the characters of salite and augite is so great, that at least as long as the Wernerian method of arrangement continues to prevail, they will be separately classed and described.

The variety of salite discovered in Norway got the name of *malacolite,* from Abilgaard; and this name seems to have been adopted by Haüy.

The colour of salite is light greenish grey. It occurs massive; but in almost all the specimens which I saw at Sala, to the number, I should suppose, of about 100, a tendency to crystallization could always be perceived, and a distinct prism may be extracted with smooth faces.

This prism, which may be considered as the primitive form of salite, appeared exactly the same with the primitive crystal of augite, as far as it was possible to judge by the eye, for I had no means of measuring the angles with accuracy; that is to say, a rhomboidal prism, which by the eye can hardly be distinguished from a rectangular parallelopiped, the angles not differing much more than two degrees from right angles. I speak from memory, not having at hand any crystals of salite to make the measurement, nor having it in my power to consult Haüy's dissertation on the subject, in which he has given the result of his own measurement.

The fracture of salite is distinctly foliated and a threefold cleavage, corresponding to the sides of the rhomboidal prism, may be perceived. It is translucent on the edges. It does not strike fire with steel; but is capable of scratching glass. It is brittle, and its specific gravity, according to the experiments of D'Andrada, is 3·2368. Before the blow-pipe it melts into a transparent glass. The only analysis of this mineral, with which I am acquainted, is that of Laugier, which is as follows:

| | |
|---|---|
| Silica | 53 |
| Lime | 20 |
| Magnesia | 19 |
| Alumina | 3 |
| Oxide of manganese | 4 |
| Loss | 1 |
| | 100 |

This corresponds very nearly to the constituents found in augite by the latest and most accurate analyses, with this difference, that augite contains at least 12 per cent. of oxide of iron which is wanting altogether in salite. Whether the constant presence of such a constituent, in defiance of a similar crystallization, be sufficient to constitute a peculiar species; or whether the crystalline forms of salite and augite be absolutely identic, are questions that would require some consideration before two minerals, so different in their general aspect, are confounded together under the same name.

Salite is not confined to Sweden and Norway. It has been found in Scotland by Colonel Imrie, and it occurs likewise in Greenland, being observed in considerable quantity in a set of minerals collected in that country by Geiseke, and purchased by Colonel Imrie and Mr. Allen of Edinburgh.

9. *Horn-stone,* called by the Swedes Hälleflinta. It is of a reddish brown colour, and of the specific gravity 2·6809. It is hard, brittle, has a splintery fracture, and is translucent on the edges. According to the analysis of Godon de St. Menin, the constituents of the horn-stone of Sala are as follows:

| | |
|---|---|
| Silica | 68 |
| Alumina | 19 |
| Lime | 1 |
| Oxide of iron | 4 |
| Potash | 5·5 |
| Volatile matter | 2·5 |
| | 100 |

10. *Hornblende.*

11. *Galena.* It occurs usually in the common form, and breaks into cubic fragments. Sometimes it is steel-grained.

12. *Sulphuret of antimony.* I did not see any specimens of this mineral, but was assured that it had been found in the mine of Sala.

13. *Amalgam of silver.* This uncommon mineral has not been observed in the mine of Sala for many years: only three periods when it occurred are on record; namely, 1660, 1689, and 1696.

14. *Native antimony.* This rare mineral occasionally occurs in the Sala mine; but very seldom. I saw, however, several specimens of it in the possession of Mr. Billow, and he politely made me a present of one.

15. *Blende.* This almost perpetual companion of galena occurs likewise in the mine of Sala; but I believe in very small quantity.

16 *Arsenic pyrites;* both compact and crystallized.

These, except basalt, quartz, granite, and gneiss, are all the minerals that I recollect, at present, to have met with at Sala. Salite is by far the most interesting of them all, whether we attend to its beauty, or to the way in which it occurs.

I shall now mention some of the places where remarkable minerals have been found in Westmanland.

West from Sala about twelve miles, in the parish of Fernebo, there is a small hill called Käringbricka, which consists of gneiss, containing garnets and pretty large crystals of tourmaline. They are of a black colour, and very completely crystallized. In the same hill there is found a pretty curious variety of ruthile, or oxide of titanium; for an account of which we are indebted to Ekeberg. Sometimes the colour of this mineral is steel grey, at other times reddish brown. It has a metallic lustre, strikes fire with steel, and scratches glass. It is opaque and brittle, and its specific gravity is 4·207. Before the blow-pipe it undergoes no alteration; but with borax it melts into a hyacinth-coloured bead. According to the analysis of Ekeberg, it is composed of ninety-seven parts of oxide of titanium, and three parts of oxide of chromium.* This singular result was confirmed by a subsequent analysis of the same mineral by Vauquelin.

One of the most remarkable tracts in the province of Westmanland is Ridderhyttan, a copper mine which lies in the parish of Skinskatteberg, about eighteen miles west and a little south from Sala. It is singularly situated, being nearly enclosed by four small lakes, called Linsjön, Upper Skärsjön, Lower Skärsjön, and Bjursjön; the first of which lies on the west side, and the last on the east side of the tract; the two others lie on the north and the south side of it. In this oblong square (for it extends much farther from east to west than from north to south) there are three elevated plains or hills; namely, Blokull, which borders on the westernmost lake, and Bastnäs and Körphytte, which lie near the easternmost lake. There is likewise a kind of ridge

* Memoirs of the Swedish Academy of Sciences, for 1803.

of rocks which runs along the north side of the southernmost lake. The rocks in this tract consist of mica slate. In these rocks there occur various veins of copper pyrites and magnetic ironstone, commonly separate, but in some of the veins occurring together. These veins constitute the mines which are wrought in this tract.

In these mines there occurs a kind of white cobalt ore, consisting of cobalt, iron, arsenic, and sulphur; though I do not know that it has ever been accurately analysed.

Fluor spar occurs in the same place, not crystallised, but compact, and varying in colour; being found white, violet, and emerald green.

There occur also specimens of coalblende, consisting of about one part coal, and three parts earth and oxide of iron. Hence it does not readily burn, unless it be heated with saltpetre.

Sparry iron ore likewise occurs, which was analysed by Hisinger, and found to consist of the following ingredients:

| | |
|---|---|
| Oxide of iron | 63·25 |
| Oxide of manganese | 3 |
| Lime | 1 |
| Carbonic acid | 30 |
| Water | 1·75 |
| | 99 |
| Loss | 1 |
| | 100 |

Sulphuret of bismuth likewise occurs in quartz, and in no great quantity.

In this tract there are no fewer than twenty-seven mines, either at present in existence, or which have been formerly wrought. They are all either iron or copper mines.

The minerals that occur in the copper mines of Bastnäs are the following: asbestus, actinolite, petroleum, pyrites in octahedral crys-

tals, sulphuret of bismuth, molybdena, wolfram a species of cobalt ore, which was analysed by Hisinger, and found to contain the following constituents:

| | |
|---|---|
| Cobalt | 43·20 |
| Copper | 14·40 |
| Iron | 3·53 |
| Sulphur | 38·50 |
| Earth | 0·33 |
| | 99·96 |

But the most remarkable mineral which is found in this mine is the cerite, a mineral first noticed by Bergman, and conceived by him to belong to that called tungsten, and composed of tungstic acid and lime. Eluyart analysed it, and showed that it was not tungsten. No attention was paid to it for many years, till at last it was analysed by Klaproth, and by Hisinger and Berzelius nearly about the same time. Klaproth discovered in it a new substance, which he considered as an earth, and to which he gave the name *ochroita*. Hisinger and Berzelius discovered in it a new substance, which they conceived to be a metallic oxide, to which they gave the name of *cerium*. Their results were confirmed by Vauquelin, and have been adopted by chemists. I shall here state the result of the different analyses of this substance which have been hitherto made, observing, that the differences in the proportions are most probably owing to the foreign substances with which the cerite is always more or less mixed.

According to Klaproth's analysis, the constituents are,

| | |
|---|---|
| Ochroita | 54·5 |
| Silica | 34 |
| Oxide of iron | 4 |
| Water | 5 |
| Loss | 2·5 |
| | 100·0 |

According to Hisinger and Berzelius,

| | |
|---|---|
| Oxide of cerium | 50 |
| Silica | 23 |
| Lime | 5 |
| Oxide of iron | 22 |
| | 100 |

This analysis is not contained in the first paper which they published, in the first volume of the *Afhandlingar i Fysik, Kemi, och Mineralogi, Utgifne af* W. Hisinger och J. Berzelius, p. 58; but it occurs in the statement which was afterwards published in the Annales de Chimie.

According to Vauquelin, who analysed the mineral at the request of Hisinger and Berzelius, and who was acquainted with the preceding experiments made both by Klaproth and the Swedish chemists, the constituents are as follows:

| | |
|---|---|
| Oxide of cerium | 67 |
| Silica | 17 |
| Lime | 2 |
| Oxide of iron | 2 |
| Water and carbonic acid | 12 |
| | 100 |

It is not easy to reconcile this result, as far as the carbonic acid is concerned, with the two preceding analyses.

Since the original discovery of cerium in this mineral, it has been found in various other parts of the world. A mineral from Greenland, to which the name of allanite has been given, contains about the third of its weight of it. The same species has been found in the Mysore, in India, and likewise in Sweden.

There are many other mines in Westmanland, besides those that have been noticed, but it would be tedious and of little value to enumerate them all. I shall satisfy myself, therefore, with noticing the

copper mines of New Kopperberg, which lie towards the west side of the province. The rock in which these mines occur is gneiss. The ore is copper pyrites, which is deposited in á vein partly filled with quartz, partly with mica-slate. Along with the copper ore there occurs likewise blende and iron ore. The principal minerals found in this mine are the following:

Dark red felspar, which seems to constitute a distinct vein.

Fluor spar, in cubes, which is uncommon in Sweden, and mixed with brown blende. The fluor has usually a violet colour.

Mica, actinolite, and hornblende.

The mineral to which Andrada, who observed it first in the mine of Sala, gave the name of *petalite*. Its colour is reddish and whitish grey. Massive. Lustre pearly. Translucent on the edges. Scratches glass, but not felspar. Specific gravity 2·620. Does not melt before the blow-pipe, but with borax gives a transparent colourless glass.

Quartz, galena, and iron pyrites.

In short, the number of mines in Westmanland is very considerable. Iron and copper are the most common; but several lead mines likewise occur; though, if we except the mine of Sala, none of them are of great consequence.

# CHAPTER XIV.

## JOURNEY THROUGH SÖDERMANLAND.

Hire a third Servant—Procure Passports—Mob of British Sailors—Detained at Fittje—Geognostic Constitution of Södermanland—Stages to Nyköping—Carriage breaks down—Lilla Oby—Olof Essen—Vein of Granite—Rivers little attended to in Sweden—Nyköping—Account of Tunaberg—Of Utö—Of Handvid.

ON the thirtieth of September I was ready to leave Stockholm. I hired a third servant in place of the Swede who had gone with me to Fahlun; for his refusal to accompany me down into the mines made him quite unfit for my purpose. My third servant was a black, a native of North America; English being his native language he spoke it well, and he was fluent in Swedish; but little as I myself understood of the language, I could perceive that he pronounced it very badly. He could not read, and his knowledge of the language was very limited, for I found him quite unable to explain to me the meaning of a variety of words that I met with in the Swedish books which I had with me, and which I was anxious to undertand, because they referred to regulations concerning posting, which I thought it incumbent on me to know. I made them out myself by help of a Dictionary which I had with me. This man, however, was by far the best of the three whom I had had while in Sweden. He was very honest, active, and sober; and had no other fault than an uncommon degree of timidity; which made him unfit for taking charge of the carriage in the

dark; and the days had now become so short that it was impossible to accomplish the journey in any reasonable time without encroaching upon the night.

It was necessary to procure passports, as from the nature of the Swedish police, which is an exact imitation of the French, you cannot venture to travel without being provided with one. There is no difficulty in procuring one; nothing more is necessary than to pay the fees, which amount to rather less than six shillings. For two rooms, up two pair of stairs, which I had in Stora Ny Gatan, in Stockholm, I was charged at the rate of thirty shillings sterling a-week, and two shillings every morning for coffee. These prices, considering the situation and the country, I thought unreasonably high. I could have had better lodgings in London at the same rate, though not indeed in the most fashionable part of the town. I agreed with my servant at the rate of four shillings a-day during the journey, finding him food and lodgings at the same time; and when we reached Gottenburg I agreed to give him 2*l.* 12*s.* to carry him back again to Stockholm. These terms may appear high; but they are not more so than those usually given. Had I travelled rapidly indeed, it would have been cheaper to have given six shillings a-day, which is the common fee; but as my object was to travel slowly, and to see the country, I was not more out of pocket by the 2*l.* 12*s.* at the end of the journey, and the man was better pleased.

Just before I left Stockholm I observed a sight which struck me very forcibly. No English vessels had been there for some years before; but the peace having been proclaimed about the 7th of September, one or two merchantmen had come up to the key at Skepsbruk before I left the city. On Sunday the sailors, belonging to one of these vessels, had obtained leave to come ashore. They had all got quite drunk, and had fallen together by the ears, to the number of ten or twelve, in the middle of the street, and raised a clamour that was quite diabolical. A mob immediately collected round them; but none of the Swedes interfered with the British sailors; nor did the sailors take the least notice of the Swedes. I was mortified at such indecorous

behaviour, which would naturally be construed by the Swedes into insolence. It is owing to things of this kind, of no apparent consequence in themselves, but of very great consequence on account of the impression which they make upon the people, that Great Britain is so unpopular with most nations upon the continent, and that the French, with all their injustice and tyranny, are upon the whole more acceptable. There is something in human nature which leads men to resent insolence much more than injustice. There is hardly any person who would not rather forgive a man who robbed him of his money than a man who treated him as a fool. In most Englishmen who travel, as far as I have had an opportunity of observing them, there is an unaccountable wish to let foreigners, with whom they associate, know that they despise them. The thing which surprised me most upon such occasions was, that the people among whom they were bore with them so long. I was once sitting in the pit of the theatre François at Paris, when two Englishmen, drunk I presume, seated in the front row of the second boxes, insulted the whole audience for several minutes, and made a noise that drowned that of the actors on the stage. The audience bore with them for some time merely because they were foreigners: at last four soldiers were sent into the box, who carried the culprits out of the house without any disturbance.

We left Stockholm about a quarter after five in the evening. For though horses had been ordered at one o'clock, such are the unaccountable delays that take place in towns, that it was past five before they made their appearance. Our first stage was to Fittje, a Swedish mile and a half, or ten English miles south west from Stockholm. On our arrival at this place, we were informed that no horses could be procured for fourteen hours. So that our first day's journey proved a very short one. Here I met a Russian courier, who was on his way to Stockholm, and who was likewise detained all night, though he had offered the most exorbitant price for horses, if they could be immediately procured. He came up to me the moment I arrived, and accosted me in English, offering his services to carry any thing for me to Stockholm, with so much kindness, that I could not help considering his conduct

as flowing from the predilection of the Russians for the inhabitants of Great Britain.

Södermanland, the province into which I now entered, is of considerable extent. It is bounded on the north by the lake Mälar, on the east by the Baltic sea, on the south by the province of East Gothland, and on the west by Nerike. Its greatest length from east to west may be about 100 miles, and its greatest breadth from north to south about 55. It is entirely primitive, and consists, as far as my observations went, of gneiss rocks, interspersed here and there with some beds of mica-slate, and primitive limestone. My rate of travelling through this province was so slow, that I had abundance of leisure for mineralogical investigations. The rocks at Fittje, where I was so long detained for horses, were gneiss, with uncommonly large crystals of felspar.

The stages from Stockholm to Nyköping, the first town on our way, were as follows:

| | Swedish miles. | English miles. |
|---|---|---|
| Fittje | 1½ | 10 |
| Sodertelje | 2 | 13⅓ |
| Pilkrog | 2 | 13⅓ |
| Lilla Oby | 1 | 6⅔ |
| Oby | 1 | 6⅔ |
| Svärbro | 2 | 13⅓ |
| Nyköping | 2⅕ | 14⅕ |
| | 11⅗ | 77½ |

The weather was cold, but dry, calm, and enlivened by sun-shine, very like October weather in England; so that had it not been for the shortness of the days, and the necessity of travelling part of the road in the dark, this part of the journey would have been the most pleasant of my whole travels in Sweden. Södermanland is as finely variegated with lakes as any other part of Sweden that I have seen, while the surface of the greatest part of the province is as unequal as the country round Stockholm, and indeed pretty similar. It is well wooded, but not a forest, and the autumnal dress of the trees added to the interest

of the scene, where an extensive view was to be had, by throwing a certain degree of melancholy over the whole, which never fails to attend the falling of the leaf.

My journey on the first of October was not a great deal farther than that of the preceding day had been; for soon after passing Pilkrog, owing to the folly and carelessness of the driver, one of the small wheels of the carriage broke down. We were obliged to walk on; and after attempting in vain to procure the assistance of two blacksmiths, who absolutely refused to help us, we were obliged to stop all that day, and till about eleven next forenoon, in the house of Olof Essen, a spoke-maker, who undertook to set the carriage to rights again, and make the wheel as good as ever. These repeated stops were very disagreeable; but there was no alternative. Indeed I had reason to be thankful that the misfortune was not without remedy, and that I was so fortunate in so unlikely a place as to meet with a man capable of putting the carriage to rights again and willing to undertake it.

Lilla Oby was a very pretty place. It was a kind of a village; at least there were a good many houses scattered about, and there was a church in the neighbourhood, which had been rebuilt in 1793, and which was called Adolphus Frederick's church. The whole landscape was variegated with a number of low round hills, each perhaps 50 feet in height, and either covered with wood or with heath, thick scattered with common juniper. The rocks were all gneiss of the oldest formation, and contained garnets of a considerable size. There were three or four small lakes in the neighbourhood, which added considerably to the liveliness of the scene. These lakes were all marshy round the edges, and had a great crop of *arundo phragmites*, or *bog-reed* growing round them. This was the case with all the small lakes in Sweden that I had an opportunity of seeing, and indicates that the small Swedish lakes are shallow. Many of them will probably in no long period of time dry up altogether.

In this part of the country there was a considerable number of cornfields. I was sorry to see large fields both of oats and barley still green

on the first of October; when the weather no longer possessed the warmth requisite for bringing them to maturity. In general, however, the barley was ripe, and the peasants were very generally employed in cutting it down. This is always performed with a scythe. As far as I had an opportunity of witnessing the processes of the harvest, the scythe is the only instrument employed in Sweden for cutting down grain. Though I saw many hundred fields cutting down during my journey, I do not remember to have observed a single sickle in the whole kingdom. At the same time it is necessary to add, that I did not see any fields of wheat in the act of cutting down, so that it is not impossible that the sickle may be used for that species of grain.

In a wood by the side of one of the lakes in the neighbourhood of Lilla Oby, I saw the common gooseberry, and the barberry, both growing wild.

Olof Essen, the spoke-maker, with whom I lodged, appeared to be in good circumstances. He was not only a spoke-maker but likewise a farmer, and had a good many houses round his own for the purposes of farming. Among others I observed a kiln, the object of which I could not discover. It could hardly be intended to dry grain, as there was no wind-mill in the neighbourhood, and no stream of water capable of driving a mill was any where to be seen. The only purpose to which I saw this kiln put was to dry wood, and it is possible that this may answer some purpose in his spoke-making profession, though I cannot well tell what.

I have already mentioned in a former chapter the ungenerous manner in which Olof Essen treated us with regard to the rate at which he let us have his horses from Lilla Oby to Oby. This treatment was the more striking, because the sum of money gained was a trifle, and because he might have put it upon the lodging, or the carriage mending, without its being possible for me to detect him; whereas the method that he took was an open and direct violation of the rate of posting imposed by the Swedish laws.

The road from Lilla Oby to Svärdbro was very hilly. The hills indeed were very low, but all of them exhibited rocks on their summit.

These in every instance, except one, near Lilla Oby, were gneiss rocks. The exception alluded to was a bed of hornblende-slate, occupying a complete hill. At Svärdbro, while waiting for horses, I observed a red stripe on the side of a hill, at the distance of about half a mile. I was tempted to go and examine it: on going up to it, I found it a vein of granite, consisting chiefly of flesh-coloured felspar, to which the red colour of the whole was owing. But it contained likewise quartz in large pieces, and mica regularly mixed. It was not possible to trace this vein for a greater length than five or six yards; below it was covered with grass, and towards the top of the hill it was covered by a great quantity of rubbish. The rock itself in which it occurred was gneiss. A little to one side of the vein there was a great ball of hornblende-slate, which appeared lodged in the gneiss.

Near Svärdbro, there ran a rivulet along the side of the road of no contemptible size, considering the country in which it occurred. On asking the post boy the name of this rivulet, I was told that it had no name. An answer of the same kind was made me upon other occasions. I have met with the same thing in different parts of England. Nothing is more striking than the difference attached to the importance of rivulets in flat and hilly countries. In Scotland every rivulet however small is distinguished by a name, and the same observation applies to all the hills in the country. While in England and Sweden many of the rivulets and hills pass undistinguished and unnamed. This difference is not owing to any superiority or inferiority in the Scottish peasantry, when compared with the English and the Swedes, but to a difference in their situation. Necessity has obviously given birth to all names, and nothing therefore is distinguished by a name till it becomes an object of some importance. The torrents in a hilly country, however insignificant they commonly appear, are apt occasionally to swell to an enormous size, and thus command attention by the devastations which they commit, or by interrupting the progress of the traveller. Nothing of that kind being likely to happen in a flat country, the rivulets remain without distinction.

To give the reader an idea of the rapidity with which torrents some-

times swell in hill countries, I may mention a circumstance which once happened to myself. About 17 years ago I was travelling on foot, in company with my brother, from Perthshire to Edinburgh, and we took the direct road across the Ochil hills to the Queen's-Ferry. This road is very hilly, and at that time the road was not so good as it is at present; for it has been lately renewed at a great expense. While travelling through Gleneagles, we were interrupted by so violent a wind and rain, that we found it impossible to proceed; but stopped short at the Yates of Muckart, from about eleven o'clock in the forenoon till nearly five in the evening. By this time the weather had cleared up, and as it was about the time of full moon, we were tempted to continue our journey to the Queen's-Ferry, which was about 15 miles farther on. We found in more places than one the road crossed by torrents, so large and so impetuous that it was impossible to pass them without the assistance of horses. Probably next day, or even a few hours after, these torrents would be quite dry.

I reached Nyköping about six in the evening of the 2d of October, having only travelled 77½ miles in two days and a half. But this slowness was owing to a series of disastrous accidents. The very first stage I lost 14 hours for want of horses. Next day my carriage broke down soon after noon, and the remainder of that day and the morning of the next were lost in putting it again in a condition for travelling. On the third day I might have gone on a stage beyond Nyköping; but being desirous to visit Tunaberg, I was on that account compelled to take up my quarters in that town; because it was the nearest point to Tunaberg, upon the great road. To have gone on to Tunaberg would not have answered, because it is an out of the way place, and it was very unlikely that I could be accommodated there with lodgings.

Nyköping, though a small town, has an air of magnificence, and is prettily situated, not far from the extremity of one of the bays of the Baltic. A small river runs by it, and falls into that bay. But I could perceive no symptom whatever of trade. The streets are wide, and the town, like all the other Swedish towns, Stockholm and Gottenburg

excepted, is built of wood. I think it but fair to say that the inn at Nyköping was the best I met with in Sweden.

Next morning about seven (for it is difficult to get away early from a town in Sweden) I set out on my proposed visit to Tunaberg; a copper mine of some celebrity in consequence of the considerable quantity of cobalt ore which it yields. Tunaberg lies within about two English miles of the sea, near the commencement of the bay of Bronick, which runs a good way inland, and terminates not far from Norköping. It is $1\frac{4}{7}$ Swedish miles, or $1\,1\frac{2}{3}$ English miles from Nyköping. The road to it is a bye-road, narrow and intricate, winding through a very hilly, wild, and romantic country. The morning was unfortunately hazy, and it began at last to rain, so that my view was in a great measure interrupted: but it cleared up about mid-day, and the afternoon and evening were very clear and fine. The hills, which as usual were very low, were all covered with pines.

The rocks at Tunaberg are very distinctly gneiss, and the ore lies in veins, which as far as I could make out run in an easterly direction. There are two different mines wrought at Tunaberg, a copper mine and an iron mine, but neither of them to any great extent. The copper mine is the most westerly of the two, and is likewise the most important. The vein is filled with limestone, in which copper pyrites is scattered in no great abundance. Cobalt glance, usually in crystals, is scattered through the limestone likewise, and in no great quantity. Sometimes also galena is observed. Formerly it existed in such quantity that lead was obtained from it; but of late years the proportion of galena has diminished so much that this branch of mining has been entirely laid aside. Formerly pieces of serpentine were likewise found occasionally in the same vein; but for some time back they have disappeared.

The glance cobalt crystals are usually cubes, or octahedrons, or dodecahedrons, or icosahedrons; all of which occur of a very considerable size. The cobalt ore is picked out with considerable care, reduced to a coarse powder, and made up into bags, which are all exported to

England, where the ore is in great request for the use of the potteries. I saw a number of bags of it made up for sale, and labelled in English, *sulphureted oxide of cobalt from Tunaberg*. The only analysis of this ore, of which we are possessed, is that of Tassaert, who found its constituents as follows:

| | |
|---|---|
| Arsenic | 49·00 |
| Cobalt | 36·66 |
| Iron | 5·66 |
| Sulphur | 6·50 |
| Loss | 2·18 |
| | 100·00 |

If this analysis be correct, the title *sulphureted oxide of cobalt* by no means applies to this ore. It seems rather to be an alloy of arsenic and cobalt.

There occurs in this mine occasionally a very beautiful variety of green-coloured felspar, which was first particularly observed by Mr. Svedenstierna. Its colour varies from light to dark green. It consists of a congeries of small distinct crystals, which seem to be six-sided prisms, with pointed extremities. External lustre small; internal, splendent: translucent. Specific gravity 3·1849. Before the blow-pipe it melts into a transparent, slightly-greenish bead; and if the heat be continued, it swells and froths.

The limestone which occurs in this vein contains manganese as one of its constituents. When burnt, it loses 0·40 of its weight. Cronstedt, in his Mineralogy, describes various kinds of copper ore, as malachite, copper pyrites, and grey copper ore. But the only copper ore that I was able to discover was copper pyrites, and even that in no great quantity, comparatively speaking.

In what is called the *Mormorgrufvan*, at Tunaberg, there occurs a mineral which deserves to be mentioned. I did not myself see any specimens of it; but there is a description and analysis of it, by Mr. Hedenberg, published in the second volume of the *Afhandlingar, i Fysic, Kemi, och Mineralogi*, p. 164. From the description, one

would be tempted to consider it as a very impure specimen of sparry iron ore; but the analysis does not agree with this supposition. Its colour is dark green, and it is massive, but splits into fragments having the primitive form of carbonate of lime. It is not particularly hard. Its specific gravity is 3·154. Its constituents were found to be the following:

| | |
|---|---|
| Silica | 40·62 |
| Lime | 3·37 |
| Alumina | 0·37 |
| Oxide of iron | 35·25 |
| Oxide of manganese | 0·75 |
| Carbonic acid | 1·56 |
| Water | 16·05 |
| Loss | 2·03 |
| | 100·00 |

The iron mine at Tunaberg lies about two English miles from the copper mine. The ore is magnetic ironstone, and it is mixed in the vein with hornblende, garnet, quartz, and mica. The rock in which this vein occurs is gneiss. There is another mine likewise of iron ore, at no great distance, called Uttervik; but the day was so bad that I did not visit it. I was told of two other iron mines in the same neighbourhood, called Damgrufvefalt, and Skepsvik; but it was quite impossible to visit them without devoting another day to that object, and considering the lateness of the season, and the frail state of my carriage, I did not think it prudent to do so.

The copper mine at Tunaberg is seventy fathoms deep, and the method of working it seems to be peculiarly bad. There is no great command of water in the neighbourhood; but still there is a small stream, which, in former times, appears to have been employed to turn round a water-wheel, by means of which pumps were driven, which cleared the mine of its water. The ruins of all this machinery are still visible. That the stream might still answer the same purpose is pretty evident, as there is a threshing-machine in the neighbourhood driven by this very stream. But at present all the water is dragged up

the shaft of the mine in open buckets, and the moving power is a horse. A man stands at the mouth of the shaft, empties the bucket when it comes up, and sends it down again. When I asked the mine-master the reason of such a rude contrivance, and attended with so much expense, when a better one might be so easily adopted, he assured me that the mine was too deep to be emptied by pumps; and though I mentioned the mine of Fahlun, and of Sala, both much deeper, and which, notwithstanding, were kept clear of water by pumps, it produced no effect on him whatever. Nor would it be possible to make any improvement in the working of this mine, without changing the persons who have the management of it. A certain degree of knowledge seems absolutely necessary before mankind are susceptible of improvement. The great difficulty is to bring them to that state. After they reach it, they acquire an avidity for additional knowledge, and improvement goes on without any impediment. By what means mankind are brought into this state is a problem of very difficult solution. The Greeks reached it at a very early period; and the progress which they made afterwards is wonderful. The Romans slowly imbibed their knowledge from the Greeks, but do not seem to have arrived at the requisite period, till the vices of their government more than counterbalanced all the other advantages in their situation. Colonization seems to have but little tendency to improve savage nations. The Hottentots in Southern Africa, and the natives of America, have not acquired civilization from the European nations that have been planted beside them. The Hindoos, though much farther advanced in civilization than these barbarous nations, are not advanced so far as to be susceptible of imbibing further improvements; and, accordingly, they have reaped no benefit from the example of the various civilized nations who have been repeatedly planted among them. The same remark applies to the Chinese.

Religion seems, in some cases, to constitute a barrier against all further progress in civilization. Hence, probably, the reason why the inhabitants of India and China have stopped short at that half-

civilized state which they reached so long ago. Before attempting to improve them, it would be necessary to get rid of their religion. But this will not account for the difficulty of conveying improvements through certain classes of men, even in civilized nations. The farmers, for example, in some of the southern and midland counties of England, seem to reject improvements with an enthusiasm and determination of spirit that appears quite unaccountable, as it is so contrary to their real interest. The same observation applies to miners, who not unfrequently persist in absurd methods of working, with amazing obstinacy, even after the absurdity has been demonstrated to their own apparent conviction. I could point out some singular instances of this in Great Britain, if it were not for the impropriety of exposing the names of individuals. The instance which occasioned the whole of these observations may however suffice. It is the more extraordinary, as the mine of Tunaberg belongs to two persons only, who would naturally be induced, one would think, by regard for their own interest, to get their mine wrought in the best and most economical manner. Sometimes, on the other hand, a rage for improvement produces as bad consequences as the most determined resolution to resist every change. The Russian proprietors of iron mines had made themselves acquainted with the mode of smelting and manufacturing iron in Great Britain. They were particularly struck with the great scale on which these manufactures were carried on, and resolved to imitate it. Accordingly, some prodigious iron-works were established in Russia. The fuel employed, however, was not pitcoal, as in Great Britain, but charcoal, the only kind of fuel which their country produced. The consequence was such a prodigious consumption of timber, that the woods in the neighbourhood were consumed, and the work was of course brought to a stand, and ruined, for want of charcoal. The Swedes have avoided this evil, by having all their iron-works on a very small scale. Hence they are scattered over the whole kingdom, and the consumption of wood in each is too trifling to have any effect in thinning the country of that indispensable article. The great scale

upon which the British manufactures are carried on is owing, in a great measure, to the copious supply of pit-coal which exists in all the manufacturing counties.

The water drawn up from the mine at Tunaberg is employed in washing the ore. It is then picked by men, who carefully separate all the pieces of cobalt ore, and set them aside. The copper ore is then roasted, and the process of smelting, I was told, was the same as at Fahlun. I did not see the process; for the day on which I visited Tunaberg was Saturday, and the smelters were not at work. There was no ore roasting, nor indeed any large collection of it. Hence there was not constant employment for smelters. Indeed, the mining business at Tunaberg is conducted on a very diminutive scale. The number of miners amounts to about sixty. The mine belongs to two private individuals, who are partners. The number of miners in the iron mine amounts to about thirty.

I left Tunaberg about twelve o'clock at noon; and as we were assured by the people of the post-house, that we might cross directly the arm of the sea called Bronick Bay, which runs up towards Norköping, and from which our distance was but inconsiderable, I determined to take that road, partly because it was much shorter, and partly because I wanted a bottle of the water of the Baltic, at that place, for analysis. We accordingly drove directly to the bay; but when we came to the shore, we had the mortification to learn, that there was no possibility of crossing at that place, there not being a single boat belonging to any person in the neighbourhood. I had the satisfaction, however, of filling a bottle with the water of the bay, which was about two miles wide. As no river runs into the bay near this place, and as it is not far distant from the Baltic itself, I conceive that the water which I took up here will afford a pretty fair criterion of the saltness of the Baltic sea in this latitude. The result of my trials upon this, and several other specimens of the sea-water which surrounds Sweden, I shall give in a subsequent chapter.

In consequence of this disappointment, we were obliged to measure our steps back again; and at sun-set, after having travelled about

twenty miles since we left Tunaberg, we found ourselves at Jäder, only twelve English miles from Nyköping, the town which we had left in the morning. It was necessary to get to Norköping that night, which was $6\frac{1}{2}$ Swedish miles from Nyköping; so that I was obliged to travel the greatest part of this road in the dark. For, owing to the badness of the roads, and the badness of our driving, we did not arrive at Norköping till eleven o'clock at night.

The roads were very hilly, and appeared as if they were sandy; though the darkness of the night prevented me from ascertaining whether they were really so or not. The country was a forest, with beautiful lakes and hills interspersed at intervals, which gave the prospect, as long as any light continued, an interesting appearance. We passed by a cannon-foundery in our way, situated in a most romantic position, by a lake, and finely wooded. Here the road lay through a long straight avenue of very fine trees. It was too dark for me to see what species, though they had somewhat the appearance of oak.

During this journey, though the night was very clear and serene, we passed through different strata of very thick fogs. They were low, and of small extent. They had a musty smell, and were confined to narrow hollows or valleys, beyond which the atmosphere was clear. There is something connected with the temperature of the surface of the earth, in low grounds, which I do not very well understand. It appears, both from these phenomena of the fogs, and from many facts well known to gardeners and farmers, that there is a certain elevation of ground where the temperature never sinks so low as it does in those places that lie at a lower level. For example, if you place a thermometer on the surface of the ground at the top of Harrow-hill, and another at the bottom of the hill, during the spring months, you will find the temperature much lower at the bottom than at the top of the hill. Nothing is more common than for the gardens to be destroyed by a frost at the foot of the hill, while those at the top escape. Hence the reason of the low fogs which so often occupy deep valleys in the spring and autumn, while the higher grounds are clear. The

first facts respecting this curious subject were obtained by Dr. Wilson, at Glasgow. His curious observations were published in the Philosophical Transactions; but it is a branch of meteorology almost quite unexplored; though it is highly deserving of investigation, even in a practical point of view, independent of the light which it is likely to throw upon the distribution of temperature, as far as that distribution is affected by the elevation or depression of the places above or below the level of the sea.

Besides Tunaberg, there are one or two other places in Södermanland which deserve to be noticed, on account of the minerals which they yield.

One of the most remarkable of these is the iron mine of Utö, which is situated in an island of the same name, not far from the place where the bay of Stockholm terminates in the Baltic. It is a Swedish mile in length, and about half a mile in breadth. Like the rest of Södermanland, it consists of gneiss rocks, with some beds of mica slate, quartz, and primitive limestone containing magnesia interspersed. The iron ore lies in veins, and the veinstones are principally quartz, iron flint, and actinolite. The iron ore, as far as I observed it, consisted of a magnetic ironstone, which indeed constitutes the common Swedish ore of iron. The principal minerals found in this mine are the following:

1. White and reddish granular limestone. Likewise calcareous spar, and various crystallized specimens of the same mineral.
2. Black, coarse scaly mica.
3. Bluish-grey, straight foliated felspar.
4. Emerald-green, transparent felspar, in red granular lime-stone.
5. Red, compact felspar.
6. Spodumene (triphane of Haüy). This mineral was first particularly distinguished by D'Andrada, and was likewise described by Haüy in the appendix to his Mineralogy, under the name of triphane. In the mine at Utö it is found imbedded in quartz and in felspar. It occurs in foliated masses, from which a rhomboidal prism, with angles of

128° and 52°, may be extracted. Its colour is whitish green. Its primitive shape is a rhomboidal prism, with angles of 80° and 100°. It has a threefold cleavage, two of them parallel to the sides of the primitive crystal, and one in the diagonal of that prism. Its specific gravity is 3·1923. Its lustre is pearly. It is hard enough to scratch glass. This mineral was originally considered as a species of zeolite; but it has very little resemblance to that tribe of minerals. It is more similar to felspar, from which, however, it is easily distinguished. Before the blow-pipe it becomes opake, splits into thin plates, and at last melts into a greyish globule. The first analysis of this mineral was by Vauquelin. But it was rather imperfect, in consequence of the small quantity of matter upon which he had to work. The result which he obtained was as follows:

| | |
|---|---|
| Silica | 56·5 |
| Alumina | 24·0 |
| Lime | 5·0 |
| Oxide of iron | 5·0 |
| Loss | 9·5 |
| | 100·0 |

A more complete analysis was afterwards made by Hisinger, who obtained the following results:

| | |
|---|---|
| Silica | 63·40 |
| Alumina | 29·40 |
| Oxide of iron | 3·00 |
| Lime | 0·75 |
| Volatile matter | 0·53 |
| Loss | 2·92 |
| | 100·00 |

This result was confirmed by Berzelius, who repeated the analysis, and obtained the following constituents:

| | |
|---|---|
| Silica | 67·50 |
| Alumina | 27·00 |
| Oxide of iron | 3·00 |
| Lime | 0·63 |
| Volatile matter | 0.53 |
| Loss | 1·34 |
| | 100·00 |

By a still more recent analysis of Fourcroy and Vauquelin, its constituents have been found as follows:

| | |
|---|---|
| Silica | 64·4 |
| Alumina | 24·4 |
| Lime | 3·0 |
| Potash | 5·0 |
| Oxide of iron | 2·2 |
| Loss | 1·0 |
| | 100·0 |

7. Indicolite. This is the indigo-coloured tourmaline of Haüy.

8. Apophylite or ichthyophthalmite. This mineral was first distinguished by D'Andrada. It occurs not only at Utö but likewise in the mine of Arendhal in Norway. Its colour is white, with a slight shade of yellow or green. It occurs massive and crystallised in rhomboidal prisms, with angles of $83\frac{1}{2}°$ and $96\frac{1}{2}°$. It occurs likewise in four-sided and six-sided tables. Lustre pearly. Translucent. Principal fracture foliated, cross fracture fine grained uneven. Specific gravity 2·491. Before the blow-pipe it froths and melts into a semi-transparent bead. According to the analysis of Rose its constituents are as follows:

| | |
|---|---|
| Silica | 52 |
| Lime | 24·5 |
| Potash | 8·1 |
| Volatile matter | 15 |
| Loss | 0·4 |
| | 100·0 |

The analysis of Fourcroy and Vauquelin does not differ much from the preceding. It is as follows:

| | |
|---|---|
| Silica | 51 |
| Lime | 28 |
| Potash | 4 |
| Water | 17 |
| | 100 |

9. Greenish and reddish brown iron flint.

10. Bluish quartz.

11. Prisms of arsenic alloyed with iron in quartz.

12. Galena in quartz, and mixed with the iron ore.

13. Native silver in grey copper ore and iron ore.

14. Lepidolite. This mineral occurs in the iron mine of Utö, sometimes of a greyish, and sometimes of a light violet colour. Its constituents, according to the analysis of Hisinger, are as follows:

| | |
|---|---|
| Silica | 61·60 |
| Alumina | 20·61 |
| Lime | 1·60 |
| Oxide of manganese | 0·50 |
| Oxide of iron, a trace | |
| Potash | 9·16 |
| Volatile matter | 1·86 |
| Loss | 4·67 |
| | 100·00 |

Lepidolite is remarkable as being the first mineral in which potash was found as a constituent.

In the parish of Oker, a little to the west of the palace of Gripsholm, which lies in a small island in the Mälar, there is an iron mine called *Handvid*, the ore of which, from the specimens that I saw, for I did not visit the mine, consists of magnetic iron stone. It is said to consist of a vein situated in sienitic granite; but in all probability, had I been on the spot, I should have found it to consist of

gneiss, like all the rest of the country. Near this mine there occurs a granular limestone, which was employed in smelting the ironstone. But the workmen found that it did not answer the purpose, and that the more of the lime they employed in their process the more refractory did the iron become. Surprised at this circumstance, specimens of the limestone were sent to Mr. Svedenstierna, who soon found out the reason. It is thick scattered with octahedral crystals of spinell, possessing the usual properties of that mineral. The colour of the spinell is usually greyish blue; generally in regular octahedrons, though sometimes in small grains. Lustre splendent. Translucent. Readily scratches quartz. Specific gravity from 3·482 to 3·6842. Not altered before the blow-pipe. According to the analysis of Berzelius the constituents of this mineral are as follows:

| | |
|---|---|
| Alumina | 72·25 |
| Silica | 5·48 |
| Magnesia, with a little manganese | 14·63 |
| Oxide of iron | 4·26 |
| Matter not examined | 1·83 |
| Loss | 1·55 |
| | 100·00 |

In the parish of Svärta, a little to the north of Nyköping, there is an iron mine called Sjösa, consisting of magnetic ironstone in a gneiss rock. This mine is remarkable for containing the mineral called scapolite, (parenthine of Haüy) originally discovered in the mine of Arendhal in Norway. The scapolite of Sjösa mine is of a reddish brown colour, and occurs in red-coloured calcareous spar. It is usually crystallized in the following shapes.

1. A four-sided rectangular prism. Sometimes two or three of the longitudinal edges of the prism are truncated.
2. Six-sided compressed prism with two opposite broad faces.
3. Six-sided prism with two terminating broad faces.
4. Cylinders with numerous unequal channelled faces.

Opake. Scratches glass. Specific gravity 2·6433. Its constituents, according to the analysis of Berzelius, are as follows:

| | |
|---|---|
| Silica | 61·50 |
| Alumina | 25·75 |
| Lime | 3·00 |
| Magnesia | 0·75 |
| Oxide of Manganese | 1·50 |
| Oxide of iron | 1·50 |
| Volatile matter | 5·00 |
| Loss | 1·00 |
| | 100·00 |

In the iron mine of Gillinge in the same parish, there occurs an ore of iron which appears still undescribed.

Its colour on the outside is black; but when fresh broken the colour of the inside is somewhat lighter. It occurs massive; but consists of plates parallel to each other, the surface of which have considerable lustre. Sometimes thin layers of calcareous spar occur between these plates. Fracture earthy. Fragments flat and sharp edged. Soft and sectile. Easily scratched by iron. Streak and powder greyish green. Surface feels smooth. Specific gravity 3·045. When acted on by the blow-pipe it becomes magnetic. With borax it melts into a yellowish green glass. Its constituents, according to the analysis of Hisinger, are as follows:

| | |
|---|---|
| Oxide of iron | 51·50 |
| Silica | 27·50 |
| Alumina | 5·50 |
| Oxide of manganese | 0·77 |
| Magnesia | a trace |
| Volatile matter | 11.75 |
| Loss | 2.98 |
| | 100·00 |

I was informed that there is a marble quarry situated upon the north side of the bay of Bronick; but had no opportunity of seeing it, as we could find no road that led along the north side of the bay; but were obliged, in consequence, to return back to the great road which we had quitted at Nyköping.

# CHAPTER XV.

## JOURNEY THROUH EAST GOTHLAND.

Account of Norköping—Valley of Motala—Granite Veins—Linköping—Slowness of travelling—Lake Vetter—Beauty of the Country—Ancient Castle—Waters of Medvi—Geognostic Constitution of East Gothland—Floetz Track—Porphyry at Grenna—Mineralogy of East Gothland.

WE reached the city of Norköping about eleven at night, and, in consequence of the great scarcity of inns in the Swedish towns, it was with great difficulty we got lodgings. What increased the difficulty at Norköping, it happened to be market-time, and the town of consequence was crowded with people; and, to add to the crowd, there were 500 soldiers quartered on the inhabitants. We drove from one place to another, and were not a little puzzled what to do. At last, just after having been assured by the people of a particular house that it was quite full, and while we were considering where to go next, we met the landlord coming down the street. He spoke to us, and after he had been made acquainted with what we wanted, he requested us to drive into his yard, and informed us that he could easily accommodate us with lodgings for the night. Accordingly he showed us up into a room; but it was one o'clock before we could get supper over: of course it was late next morning before we rose.

Norköping is a town of considerable size, and is reckoned the fourth in Sweden. It occupies a large space of ground, and is even said to be

ten miles in circumference; but that is a gross exaggeration. The streets are scattered, and imperfectly filled up with houses, somewhat similar to Manchester, where great gaps are perceptible in almost all the streets of the town. The number of inhabitants in Norköping amounts to about 10,000. I was able to walk from one extremity of the town to the other in less than half an hour, so that I do not conceive the greatest length to amount to more than two English miles. The breadth is inconsiderable. Norköping has a good deal of commerce. The river Motala runs through it, and is navigable, for small vessels, nearly up to the town. This river, or at least a branch of it, runs out of the lake Vetter, at Motala, and passing through a considerable number of small lakes, at last falls into the bay of Bronic, a little to the east of Norköping. At the west end of Norköping it divides into four distinct streams, which flow with considerable rapidity, and, indeed, constitute a series of cataracts. These streams all unite in the middle of the town, and form a river of no contemptible size. Except the Gotha and the Dal, it is the largest river which I saw in Sweden. There are three wooden bridges thrown over it within the town, two of them for foot-passengers only, and the other for carts and carriages. This last bridge is wide and convenient; it lies nearest the mouth of the river, and a little below it a considerable number of small vessels were lying. Norköping is a manufacturing town, particularly of cloth. There are likewise a great many corn-mills along the river, and a great deal of corn is exported from this city. Indeed, it lies at the extremity of by far the finest corn country that I saw in all Sweden. The other manufactures at Norköping are inconsiderable. There is a sugar-house or two in the town, and a manufactory of snuff. I did not learn whether the brass-foundery formerly established there still exists. The day on which I was at Norköping being Sunday, prevented me from seeing the manufactures to any advantage.

We left Norköping about half-past ten on Sunday, and were drawn by the two most miserable horses that I had yet seen in Sweden. The road was hilly, and we found it absolutely impossible to get on

without alighting, and walking the greatest part of the way. The consequence was, that it took us two hours and a quarter to travel $1\frac{1}{4}$ Swedish, or $8\frac{1}{3}$ English miles, which was only a very moderate walking pace. It is singular enough that, in travelling through Sweden, you always get the worst horses, and are longest detained at the towns, yet you pay a third more than in the country where you are quicker and better served.

The road through which we travelled this stage put me more in mind of Great Britain than any other part of Sweden. It was all cultivated, all divided into corn-fields, and thick scattered with clumps of oak, birch, and other deciduous-leaved trees, while rows of poplars often surrounded the corn-fields, and scarcely any pines were to be seen. The soil was a clay, and appeared very fertile. The corn was mostly cut down, and those fields where it still stood bore an excellent crop. The oats were all ripe, which was not the case in any other part of Sweden that I visited. Indeed, this valley of the Motala (for the river runs through it) is very favourably situated. There is a range of low hills on the north side of Norköping, which screens it from the north-east wind, by far the coldest in Sweden, as well as in Great Britain.

At a church-gate, the first on the south side of Norköping, there were two new granite pillars, with several very distinct veins of red-coloured granite in them. A little farther on, near the road-side, was the house of Captain Omanson, of the Swedish navy; which, in the way that the neighbouring grounds were laid out, and the kind of wooden paling that enclosed them, put me very much in mind of an English villa, with this only exception, that the paling was painted black.

Within about an English mile of Brink, our first stage, upon the edge of an eminence near a lake, in rather a beautiful situation, stands the house of Count Piper, a noble family long distinguished in Sweden. At Brink we were detained very long for horses. The consequence was, that our journey from Norköping took us up all day, without going over much ground. The country between Brink and Kumla is

very bare of wood. It is more level than the preceding stage, though there are many hills or knolls. The whole country here, with a few exceptions, is uncultivated; and the fields, being thick scattered with juniper-bushes, have much the same appearance, at a distance, as our heaths with the furze-bushes which usually cover them, at least, in part.

The rocks at Kumla were perfect granite. The lower part of the post-house, where we stopped for horses, consisted of large blocks of a sienite, containing large crystals of felspar, or a kind of sienite porphyry. But the neighbouring fields were thick scattered with large blocks of gneiss.

Our next stage was Linköping, the capital of the province; which though a small, is a much finer looking town than Norköping. The streets are more regular, the houses larger and more elegant. There are two churches in the town, both of them large, and rather splendid in the outside. I did not go into either of them. One was at the time repairing; so that divine service was confined to the other. Though it was Sunday, I was too late to perceive any symptoms of that day. For it was sun-set when I arrived at Linköping, and the Swedish Sunday terminates at six o'clock in the evening. I was struck with the appearance of a very magnificent theatre, standing just beside the principal church. To the eye it seemed as large, and externally as magnificent, as the Opera-house in Stockholm. Except at Stockholm and Gottenburg, I had not seen any theatre in any of the towns of Sweden. What encouragement a small town like Linköping, which cannot contain 3000 inhabitants, can give, sufficient to induce a set of players to take up their residence in it, is very difficult to conceive. If Linköping were a royal residence, we might ascribe the theatre to the King of Sweden, and conceive that he supported the players at his own expense; but as this is not the case, we must either ascribe the theatre to the inhabitants, or to the governor of the province. I stopped at Mölby, which I reached about half-past eleven at night. The stages and distances of the day's journey were as follows:

| | Swedish miles. | English miles. |
|---|---|---|
| Brink ..... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Kumla..... | $1\frac{1}{8}$ ..... | $7\frac{1}{2}$ |
| Linköping ..... | $1\frac{5}{8}$ ..... | $10\frac{5}{6}$ |
| Barkeberg ..... | 1 ..... | $6\frac{2}{3}$ |
| Mölby..... | $1\frac{7}{8}$ ..... | $12\frac{1}{2}$ |
| | $6\frac{7}{8}$ | $45\frac{5}{6}$ |

A very short journey, it must be acknowledged, to occupy thirteen hours. But the slowness of our first stage, in consequence of the badness of the horses, and the length of time that we were detained at every post-house for horses, except at Linköping, where we were so unusually lucky as to get horses immediately, sufficiently account for the little progress which we made. Travelling in Sweden would be rapid and agreeable, if it were not for the almost constant detention which you have to look for at every stage; a detention that never can be remedied, as long as the regulations of posting continue as they are, and as long as every postman has a monopoly which cannot be destroyed by any little irregularity in his conduct. Suppose you lodge a complaint in the Dagbok; it is obvious that such a complaint can be attended with very little effect. You are not present to confront the culprit, supposing him to undergo an examination. He is therefore at full liberty to contrive excuses, and invent plausible reasons for his conduct, which the governor of the province, supposing him never so much inclined to do justice to all parties, is neither able to refute nor detect. Besides, as almost all the post-houses are alike, the number of complaints would be so great, that the governor could not well examine them all, and would be disposed, out of regard to his own ease, to let them pass off as gently as possible.

Next morning I set out from Mölby, about half-past six. My object was to get to Iönköping that night, which was but an easy journey, provided that horses could be readily procured, and that no accident happened to the carriage. The stages through which I had to pass were the following:

| | Swedish miles. | English miles. |
|---|---|---|
| Ostad ..... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Ödeshog ..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Holkaberg ..... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Grenna ..... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Roby ..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Iönköping ..... | 2 ..... | $13\frac{1}{3}$ |
| | 9 | $61\frac{2}{3}$ |

But so many cross accidents intervened, that it was half-past ten at night before we reached the town of Iönköping.

The road between Mölby and Ödeshog lay through a flat country, and was as straight as an arrow, quite different from the usual curvilinear direction which the Swedish roads affect, and which gives them so much beauty. This tract of country was well cultivated, and covered with corn, chiefly oats, but they were quite green, and would not ripen that season. I conceive this tract to be elevated at least 200 feet above the level of the Baltic. We had risen very sensibly, and continued to rise for some time after leaving Norköping. Though this height is not very considerable, it would probably have a sensible effect on the temperature, especially as this part of the country is exposed to the north east winds, from which there is nothing to screen it. The peasants were busily employed in cutting down their oats, green as they were, and the only instrument employed was the scythe.

After passing Ödeshog, I came in sight of the lake Vetter, which constitutes the western boundary of East Gothland. This lake, the longest in Sweden, forms a most magnificent expanse of water. It is at least 80 English miles in length, extending from Iönköping, which is built on its southern extremity, to Askersund, a town situated not far from its northern end. Its greatest breadth no where exceeds 18 miles, and its mean breadth does not exceed 12 miles. The height of this lake above the Venner amounts to 150 feet, and if we reckon the Venner to be 150 feet above the sea, which cannot be far from the truth, this will give us the height of the Vetter, 300 feet above the

level of the sea. The cliffs which run along its east side may be 100 feet higher. According to this reckoning, the height of the centre of Sweden above the level of the sea does not exceed 400 feet. This is a very trifling elevation, considering the breadth of the country, which is not much less than 350 English miles. Though the breadth of England be not so great, I conceive the mean height of its central parts to be much more considerable than 400 feet. In fact, if we do not reckon the narrow hilly track on the east side of the Vetter, 300 feet may be stated as the mean height of the central parts of Sweden.

The Vetter is a very transparent lake, and of a considerable depth. Its bottom is a fine yellowish white sand, quite hard and smooth: so that in summer it must constitute a delightful bathing place. Like all the other lakes in Sweden it abounds in fish. These are chiefly pike and perch. No trouts are to be found in any of the Swedish lakes, nor in any of their rivers, except perhaps in some of the mountainous districts of the north, which I did not visit, and of which consequently I cannot speak. The trout seems to be confined to hilly districts. I have been told that even in the flat parts of England they are uncommon, and that in several rivers they are not to be found. But as I state this entirely upon hearsay evidence, I cannot vouch for its truth. In Scotland, on the other hand, there are no rivers without trout; but they abound most in the small mountain streams, and are fewer in number in the great rivers. Salmon, however, are abundant in Sweden, and are caught at the mouths of many of their rivers. They have the external appearance of the salmon of this country; but their flesh is quite different, not being red, but white, and having a taste not at all similar to that of our salmon. So that the first time I saw it at table I did not know what fish it was, and was very much surprised on being told that it was salmon. I think it likely that it is a different species from our salmon; perhaps the salmo eriox, known in some parts of England by the name of Shewen.

The road from Ödeshog to Halkerberg lies parallel to the lake Vetter, and is very hilly, being made through the middle of a range of rocks, which run down along the border of the lake. These rocks consist of

low ridges covered with young wood, and, chiefly owing to the season of the year, struck me as uncommonly beautiful; the fine autumnal yellow of the birches (abundant in that district) forming a fine contrast with the deep green of the oaks and the pines. What surprised me not a little was to observe as plentiful a scattering of blocks of gneiss, mica-slate, and compact felspar over this part of the country, as in every other part of Sweden where I have been. For the rocks here, as we shall see afterwards, belong to a different class.

The road to Grenna, from Halkenberg, is partly on the top of the cliff; but at last we descend to the level of the lake, and travel at the bottom of the rock till we come to Grenna, a small town that stands about half an English mile from the bottom of the lake, but quite unconnected with it, and within a hundred yards of the cliff, which runs parallel to the lake on the east side.

It would be difficult to convey an idea of this beautiful spot by description. The lake on the west side extends in length farther than the eye can reach; but is of such a breadth that your eye catches Billingen, and the neighbouring little hills on its west side, which bound the view with a kind of sloping forest. The island of Visingbö, in a south westerly direction, with its magnificent castle illuminated by the sun, breaks in upon the surface of the lake with a fine effect. On the east your view is bounded by a perpendicular cliff near 200 feet high, the summit of which is crowned with wood, while a few small pines here and there rise out of crevices in the perpendicular face of the rock.

Before you reach Grenna you see, on the top of the hill, the remains of an old castle, quite unroofed; but the walls which are thick and strong still remain entire. From its situation it must have been a very strong place before the invention of gunpowder. These old castles, which are so common in Scotland and the north of England, are scarcely to be seen in Sweden: this being the only one that occurred to me during the whole course of my travels in that country. To what are we to ascribe this circumstance? To the freedom of the Swedes from all risks of foreign invasion? Or to the feudal system, and the independence and internal wars of the barons, having no existence? If

the last was the reason, it is very singular that while the power of the nobility was diminishing in every other country of Europe, it should have increased in Sweden. For the history of that country for the last two centuries shows a perpetual struggle between a powerful aristocracy and the authority of the king, which was backed by the affections of the common people.

At Grenna I was again detained two hours by my unfortunate carriage wheel, the iron of which had again given way, and that time elapsed before the blacksmith whom I employed was able to set it to rights. The country between Grenna and Roby pleased my eye more than any part of Sweden that I had yet seen. This was partly owing to the elevation of my situation, which enabled me to take in a considerable extent of country, for soon after passing Grenna the road again left the margin of the lake, and elevated itself to the top of the cliff, which runs parallel to the lake. On the west side the Vetter, with its beautiful island, bounded the view; or at least the country to the west of it was only seen as through a thick mist. The country to the east and south consisted of long beautifully shaped low hills with intervening valleys, all covered with young trees. These consisted partly of birch, which had put on their autumnal yellow, partly of poplars, which had assumed a deep red, and partly of oaks, willows, and pines, which still retained their natural green. It is somewhat remarkable that the birch though one of the hardiest trees of the forest, and extending to a higher northern latitude than any other tree, yet feels the effect of winter, and changes the colour of its leaves much sooner than either the oak or the beech, trees which are incapable of vegetating in the cold climates in which the birch still thrives.

Before reaching Roby, we lost sight of the lake Vetter, which was concealed from our view, by the ridge of rocks to the eastern bottom of which we had now sunk. There is a small lake at Roby, surrounded by low hills, and finely wooded. Here we found a crowd of travellers all detained for horses: we had no alternative but mixing with the company who appeared quite unconcerned, and wait till our turn came. Being the last that arrived we were obliged to wait till the whole party

had been provided with horses and sent off. By this time it was quite dark, so that I had no opportunity of seeing our approach to Iönköping. Had we travelled this stage, in day-light, it must from the nature of the country have proved uncommonly beautiful. The day had been cold, but there was constant sunshine, and a gentle wind. The evening proved more agreeable than the day, because from the lowness of our situation we were completely screened from the wind. We reached our inn at Iönköping about half past ten at night.

The lake Vetter, unlike other inland lakes, is sometimes agitated without any apparent cause, and no rational explanation of this agitation has been attempted. But the Swedes have hit upon an explanation which appears quite satisfactory to those who live upon its borders. According to them there is a communication under ground between the lake Vetter, and the lake of Constance in Switzerland. Hence, when the one rises the other falls, and when the one is agitated so is the other. This opinion they farther corroborate by asserting that the same species of fish are found in both lakes. Some go so far as to affirm, that regular accounts of the disturbances in both lakes have been kept, and that when they were compared together they were found to agree perfectly. It is quite unnecessary to examine into the validity of so ridiculous an opinion, founded on no evidences whatever, and believed only by people of no education. The smallest knowledge of the principles of hydraulics would demonstrate the impossibility of any such coincidence, even upon the supposition that the two lakes really communicated; for the distance between them is so great that there could be no coincidence in the disturbances in each in point of time.

Near the north end of the lake Vetter on its east side is situated the Medvi, the most celebrated mineral water in Sweden. It was discovered in 1677 by Hierne, who may be considered as the oldest of the Swedish chemists. Since that period it has been very much frequented by Swedish valetudinarians. It was here that the celebrated Bergman died in 1784. He went to drink the waters for the re-establishment of his health. All that we know of these waters is from a very imperfect analysis of them made by Dr. Dubb and Bergman. They contain

sulphureted hydrogen gas, oxide of iron, a little muriate of lime, and probably also some carbonic acid gas. But the proportions of these different substances stated by Bergman are founded upon too imperfect experiments to be much depended on. All that we can infer is, that the water of Medvi owes its peculiar properties to sulphureted hydrogen gas and oxide of iron.

I shall now endeavour to give a sketch of the mineralogy of East Gothland, as far as I had an opportunity of observing it. The reader will be considerably assisted by the mineralogical map of East Gothland, which he will find along with West Gothland, in Plate III.

East Gothland is a province of considerable extent. On the north it is bounded by Nerike and Södermanland, on the east by the Baltic, on the south by Smoland, which reaches a little farther north than Iönköping, and on the west by the lake Vetter. It extends from south to north in some places nearly 90 English miles, and its greatest breadth from east to west may amount to nearly eighty. But it is very irregular; for both Smoland and Södermanland run into it a considerable way in some places.

All the southern and eastern parts of this province consist of gneiss rocks, with interspersed beds of some of the other primitive rocks. The rocks about Nörkoping, and inclosing the valley of the Motala, as far as my observations went, are granite. The soil of the valley of the Motala is a clay, and it appeared to be of a greater depth than is usual in Sweden. One would be apt to suppose that wherever a clay soil covers primitive rocks, these rocks must contain a very great proportion of felspar. For neither quartz nor mica would be likely to produce clay by their decomposition, but rather sand. The clay soil of the valley of the Motala contains a good mixture of sand, and is therefore just what would naturally result from the decomposition of granite, containing a superabundance of felspar.

The rocks along the east side of the lake Venner, for a considerable extent, beginning a little to the south of the river Motala, and continuing as far south as Halkaberg, soon after passing which, I lost sight of them altogether, because the road took another direction, con-

sist of floetz rocks very similar to the floetz rocks in West Gothland, and which were described at considerable length in the third chapter of this work. In figure 6, Plate XIII., I have given a view of these rocks. The lowest consists of a bed of sandstone, and it is a sandstone quite similar to the sandstone of Kinnekulle, and the other hills in West Gothland. Over the sandstone lies a bed of alum-slate, containing stinkstone, just as the alum-slate of West Gothland and Nerike does, and it contains similar petrifactions. The uppermost rock is a floetz limestone like what occurs in Kinnekulle. The green-stone covering which distinguishes the hills of West Gothland is wanting here, as it is in Nerike. But the elevation of these rocks is not equal to the elevation of Kinnekulle, or even of Hunneberg. Thus it appears that the floetz tracks of West Gothland occur also on the east side of the lake Vetter: as I did not cross that part of the province which is in the neighbourhood of the Baltic, I had no opportunity of ascertaining whether any floetz tracks occur there; but as far as I could learn from inquiry none such have ever been observed.

The floetz track just described begins at the river Motala, and extends east as far nearly as Linköping. On the south side it reaches a little below Omberg, and, as nearly as I could judge, was bounded by the road on which I travelled from Linköping to the lake Vetter. Part of that road was travelled in the night time. But towards the west side of the track, towards the lake, I had an opportunity of seeing the country very well; and as the rocks were exposed and well marked, there was no difficulty in determining them. In this floetz tract there was a long low hill very conspicuous. The post boys and the country people could give me no information respecting its name; but from its situation it could be no other than Omberg. The cliff to the south side of this floetz track, as far as I was enabled to examine it, consisted of primitive rocks; but between the cliff and the lake there was a piece of flat country, perhaps nearly an English mile in breadth. I had an opportunity of examining this track at Grenna, where I was detained some hours by the mending of my carriage wheel. Its structure is represented in figure 7, plate XIII. The lowest part of it was a coarse

sandstone or conglomerate, which gradually as it became higher assumed the characters of fine grained sandstone. Over this lay a bed of clay slate, and the uppermost bed of all consisted of a kind of marl slate. I conceive that the lake Vetter formerly extended to the foot of the cliffs, and that these beds were formed at its bottom. Hence they may be considered as belonging to those local formations which occasionally occur in places that have been once covered with water. There is an objection, however, to this explanation. According to Hisinger the hill of Omberg, which lies farther north upon the lake side, is composed of the same beds lying in the same order. What the height of Omberg is I had no means of determining, as it lay considerably to the north of my rout. It is not so high as the cliff, but if we conceive it to have been formed under the lake, in that case the Vetter must have extended a great way farther to the west than it does at present. That it has diminished in breadth is quite evident from the appearance of its eastern shore. But not having visited its west side, it is impossible to form any opinion how far the appearance of the country is favourable to the supposition of its having formerly extended farther west than it does at present.

The only part of the cliff that I had an opportunity of examining particularly was at Grenna. Here I walked along it for some way, and found it composed, as far as I traced it, of claystone porphyry. The claystone, where I succeeded in breaking specimens not acted on by the weather, had a good deal of the aspect of felspar. I have no doubt that this porphyry would admit a fine polish; but to judge from the decayed state of the surface of the rock, it does not seem capable of resisting the action of the weather. How far it extends I had no opportunity of examining. I should not have even known of its existence had I not been detained at Grenna by the mending of my carriage. That this porphyry belongs to the primitive rocks there is no reason to doubt, for I crossed the cliff twice over in two different places, and found the rocks in both primitive. In the one they were gneiss, in the other mica slate. To have determined the relative position of these rocks, and their connection with each other, would have

taken up a great deal of time, and was quite out of my power. It would have been necessary to have walked along nearly 50 miles of cliff, which would have taken at least a week to examine it with any degree of accuracy at all.

Though Grenna and the country round it be in the province of Smöland, I thought it better to mention it here; because it is so intimately connected with that part of East Gothland which borders on the lake Vetter, and that we might not be obliged to return again to the north, when taking a view of the mineralogy of Smoland. I shall now notice some of the principal mines in East Gothland, and mention the most remarkable minerals found in them, as far as I am acquainted with the subject.

The island of Visingsö in the Vetter, as far as I could learn, for I did not visit it, consists entirely of sandstone. Pieces of grey copper ore in rolled masses are said sometimes to occur on the beach. This island formerly belonged to the Counts Brahé. Several tombs of that ancient family are still shown.

At Husquarna, a musket manufactory, about three English miles east from Iönköping, beds of sandstone are said to occur; but as I passed through that place in the dark I had no opportunity of ascertaining the nature of the rocks.

I have already noticed the marble quarry upon the north side of Bronik bay. It lies about three miles east of Krokek church, and consists of a bed of granular limestone in a gneiss rock. The marble occurs grey, green, and yellow, and is in some parts mixed with serpentine, which contributes not a little to its beauty. There are two iron mines in the neighbourhood of this quarry, namely Vesterberg and Kungsberg; but in neither of them have any remarkable minerals been observed.

A little to the west of this quarry, at a place called Finspong, there was a lead mine wrought in the year 1737, which yielded a considerable proportion of silver; the ore was galena; but this mine has been long abandoned.

In the iron mine of Hällesta, which is situated in gneiss, there

occurs calcareous spar and six-sided pyramidal crystals of the same mineral. There occur also in the same mine specimens of apophyllite, or ichthyophthalmite. They are of a white colour, and sometimes have a slight shade of red. They occur massive, but of a foliated structure, and easily divide into plates. Translucent. Specific gravity 2·417. According to Rinman, who analysed this mineral in the year 1784, under the name of zeolite, its constituents are as follows:

| | |
|---|---|
| Silica | 55 |
| Lime, with some magnesia | 27·5 |
| Alumina | 2·5 |
| Oxide of iron | 0·3 |
| Carbonic acid and water | 17 |
| | 102·3 |

There occur likewise garnets, tremolite, malacolite, and the mineral to which Andrada gave the name of coccolite; but which Haüy has united with augite. The coccolite of this mine, according to the analysis of Vauquelin, is composed of the following constituents:

| | |
|---|---|
| Silica | 50 |
| Lime | 24 |
| Magnesia | 10 |
| Alumina | 1·5 |
| Oxide of iron | 7 |
| Oxide of manganese | 3 |
| Loss | 4·5 |
| | 100·0 |

Its colour is usually yellowish green; but it occurs likewise grass green.

At Otved south-east from Linköping, and a little to the east of a string of small lakes, there occurs a copper mine, which first began to be wrought in 1413, during the reign of Eric of Pomerania, who granted the privileges which it at present possesses. After being long neglected it began again to be wrought in the year 1745. It occurs in

gneiss rocks, and the ore is chiefly copper pyrites. Magnetic iron ore occurs likewise in the same tract. Arsenic pyrites containing cobalt is said likewise to be found occasionally in the same place. Fluor spar crystallized in cubes is found likewise in this mine, a circumstance which deserves to be mentioned, because it is so rare an occurrence in Sweden.

In the lime-quarry of Barkhult, in the parish of Yxnerum, there occurs a mineral, first noticed by Hisinger, and which appears to constitute a peculiar species not hitherto known to mineralogists. Its colour is violet blue; it occurs massive; its fracture is uneven; its lustre vitreous, and it varies in intensity. Translucent on the edges. Hard; scratches glass, and strikes fire with steel. Specific gravity 2·8. Before the blow-pipe it froths and melts into a white semi-transparent glass. Its constituents, according to the analysis of Hisinger, are as follows:

| | |
|---|---|
| Silica | 46·4 |
| Alumina | 29·0 |
| Lime | 17·9 |
| Oxide of iron | 0·7 |
| Volatile matter | 3·2 |
| Loss | 2·8 |
| | 100·0 |

Such are the principal mines of East Gothland. They are much fewer in number than in some of the Swedish provinces farther to the north.

# CHAPTER XVI.

## IÖNKÖPING AND ITS ENVIRONS.

Account of Iönköping—Journey to Taberg—Description of that Hill—Seems to belong to the Floetz Rocks—Account of this Hill by Ascanius—Bergman—Tilas—Napioni—Hisinger—Haussman.

IÖNKÖPING is a small town consisting chiefly of two parallel streets running east and west. It is the capital of the province of Smoland, and the seat of the superior Court of Justice for the kingdom of Gothland. It is said to contain about 3000 inhabitants. The houses are almost all of wood, and covered on the roof either with turf or wood. The first constitutes by far the most common covering in all the Swedish towns. Slates are hardly ever seen employed as a covering for houses. All the houses that I saw covered with slates in Sweden were two, and both were in Stockholm, and standing beside each other. Like all the other Swedish towns, Iönköping has an open square, which may be considered as the market-place, round which houses have been built.

The town is beautifully situated upon the south banks of the Vetter, many of the houses standing upon the edge of the water. Each house has a communication with the water behind, and a conveniency erected for washing their linen. There is a small lake on the south side of the town, joined to the Vetter by a kind of canal at the west end of the town, for the conveniency of carrying limestone to the iron works on

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ts south banks: so that Iönköping occupies in fact a narrow isthmus between the two lakes; and nothing can be conceived more delightful than this charming situation. The country all round is hilly, and not too much covered with wood, while the Vetter insures an extensive prospect on the north, and lays open to the town the fine country and bold cliff which bounds that lake on the east side. On the south the view is not extensive. The ground rises pretty rapidly for six or seven miles; but as there is no hill, it has merely the appearance of an extensive forest. The rise is scarcely perceptible to the eye; and when you travel south, the height of the trees into which you immediately plunge, soon deprives you of the sight of Iönköping, and even of the lake Vetter. Nothing is more difficult than to form an accurate idea of the situation of an extensive flat country covered with wood; because you are never in a situation to be able to see any great extent of it at the same time.

Like all the other Swedish towns Iönköping has been repeatedly burnt down. The last accident of this kind happened in 1790, and since that time the whole town has been rebuilt. The houses are still of wood, but large and comfortable. In this country we have a prejudice against wooden houses, on the supposition that they must be very cold: but the Swedish wooden houses are warmer than houses of stone. Entire trees, merely cut into the square form, are used for building the walls, and the joinings of them are made so close, by means of moss, that no air whatever can make its way between them. Wood being a worse conductor of heat than bricks, it is obvious that a thick house of wood must be warmer than one made of any other materials.

Iönköping, while we were there, was filled with soldiers, who seemed but lately raised, and were busily employed at drill. They were all very young, and a considerable proportion both of men and officers were absolutely boys. Among them was a party of riflemen, dressed in green, with very small light muskets, and very long swords. The Swedish soldiers, of whom I saw a great number, were all well

dressed. Their uniforms, as has been already mentioned, are the same as those used in the French army.

On Tuesday, the 6th of October, I went in a one-horse cart, with a chair set in it, somewhat in the manner of our taxed carts, to see the hill Taberg, distant about ten English miles south and east from Iönköping. Taberg, which is a mountain of iron ore, has been long famous, and has been often described. I was exceedingly anxious to take a survey of it, in order to make out its position, with respect to other rocks, and to see whether the descriptions of it already published were to be depended on. Fortunately the day was good, and the neighbouring rocks are so fully exposed, that there is no difficulty in determining their nature.

The road rises all the way from Iönköping to Taberg, in some places pretty abruptly. The rocks all the way, where I could observe them, which was but seldom, were of gneiss. But the road was very sandy, as was all the neighbouring country. Is this sand to be ascribed to the decomposition of the gneiss? It is exactly similar to the sand of the lake Vetter, is very fine, and I could not by the naked eye detect any shells in it. As the country is covered with wood, Taberg does not make its appearance till you approach pretty near it; but it is seen from the east, at a considerable distance, as I had an opportunity of observing afterwards. The hill rises about 420 feet above the neighbouring country; but on account of the continual ascent from Iönköping, we may probably make an allowance of 200 feet, as the elevation of the base of the hill above the surface of the lake. If this estimate be correct, the height of Taberg above the sea will be 920 feet, which is just the height of Kinnekulle. The only part of this estimate which is hypothetical is the supposed height of the base of Taberg above the Vetter, which I did not think of ascertaining at the time. There can be no doubt that the south shore of the lake Vetter is the highest, for its issue is situated near its north end; namely, the river Motala.

The rocks round Taberg are all primitive, consisting mostly of gneiss and granite. On its south side there is a low hill quite contiguous, com-

posed of granite, and containing some very conspicuous veins of felspar and quartz. I observed in it likewise a bed of hornblende. The rocks to the north of Taberg are very low; but they possess the characters of gneiss. Probably the term gneiss might also be applied to the rocks on the south side; though I could not distinguish a slaty structure at the place where I examined it. Taberg itself is a long round-backed hill, lying in the direction of north west and south east. The east end is quite precipitous, but the west end slopes gradually down to the plain. It has two tops separated by a narrow valley. The farthest east is the highest, but the westernmost top is by far the largest. The whole hill is covered with birches and pines. The reader will find a correct representation of this hill in Plate XI.

It is upon the east side only that the structure of this mountain can be observed. On all other sides it is covered with turf and wood, so that the rock cannot be seen without digging. But on the east end the whole structure of the hill is exposed from top to bottom. When you view it at a little distance, it has the appearance of being composed of two distinct beds. The lowest of these sandstone, the highest greenstone; but a nearer inspection undeceives you: what seemed sandstone turns out to be loose sand, precisely similar to that which covers the road, and a good deal of the adjacent country. This loose sand constitutes a bed at least thirty feet thick, and so perpendicular that all my efforts to climb up were for a long time unsuccessful: I succeeded at last in reaching a particular part of the rock above, which I wanted to examine; but at the imminent hazard of tumbling down again, and I threw down such prodigious quantities of sand and rock, that it would have been impossible to follow me. As far as it was possible to ascertain the fact by actual inspection, it seemed to me quite clear that this bed of sand passes completely under the mountain. There can be no doubt that it goes a certain way; because a considerable portion of the hill on the east side has been removed, and the sand bed appears just as at first. At the same time, if the observations which I made respecting the dip of the upper bed of rock be correct, it is not at all improbable that the bed of sand is interrupted before it can proceed much

further. I was satisfied with these observations at the time; but when I reflect upon the appearance of the west side of the hill, I am apprehensive that I may have committed some error. The upper bed appeared to me to dip to the west, in an angle which could not be less than 70° or 80°.

The uppermost bed, which cannot be less than 370 feet thick, has been wrought as an iron ore these 250 years. The method is simply to blast it with gunpowder, and let it fall to the bottom of the hill, from which it is taken to iron-furnaces in the neighbourhood. This bed, when slightly inspected, at a little distance, has very much the appearance of greenstone; and, like greenstone, it is divided into blocks which have a quadrangular form, by means of rifts running both perpendicularly and horizontally. A closer inspection undeceives you, with regard to the nature of the rock. On taking it up in your hand, you are struck with its great weight; and on examining it narrowly, you find that the greatest part of it consists of magnetic ironstone. At the same time crystals, both of felspar and hornblende, are to be seen very distinctly in it. The opinion which I formed of it, after the most accurate examination I could make, was, that this rock is a mixture of greenstone and magnetic ironstone. The greenstone seems to have communicated the form and aspect of the rock; but the magnetic ironstone constitutes by far the greatest part of the mass. Between the rifts, in many places, I observed thin veins of calcareous spar mixed with bitter spar. On the south-east edge of the hill there is a pretty wide vein of clay ironstone. I traced it to the top of the hill; but lost it towards the bottom, because it was covered up with rubbish. Its width, at the lowest part of the hill that I could perceive it, is about six feet, and it becomes gradually narrower as we ascend; but again widens towards the top of the hill. On the summit of the hill, I observed several loose blocks of greenstone.

Such is the structure of this remarkable mountain. The country in which it lies is decidedly primitive, and consists chiefly of gneiss. Were it not for the bed of loose sand at the bottom, the structure would present no difficulty. If we suppose this sand not to penetrate

below the mountain, we must conclude that Taberg is a bed of primitive greenstone and magnetic ironstone occurring in gneiss. But if the sandstone goes under the hill, as I confess it appears to me to do, then we must suppose it a bed composed of a mixture of floetz greenstone, and magnetic ironstone, lying over loose sand, which covers the gneiss rocks of the country. One of these opinions must be true; and my observations rather lead me to adopt the latter than the former; for there can be no doubt that the loose sand has, for thirty or forty feet, at least, been covered by the iron ore, for so much of the mountain has actually been removed. Now I cannot conceive how gneiss could have been converted into loose sand under a bed of ironstone, which is the opinion that must be adopted, if you conceive Taberg to belong to the primitive rock.

The preceding account of Taberg I have transcribed, with little alteration, from the notes which I wrote down on the spot, while the objects themselves were before my eyes. But on a subject of so much curiosity to the mineralogist, I think it best to give a short statement of the observations of the same mountain that have been made by others, that the reader may be enabled to judge for himself which view of the subject deserves most credit.

The first account that I have seen is by Peter Ascanius, a Danish philosopher. An English translation of his description, made by Mr. Emanuel Mendes da Costa, is published in the Philosophical Transactions for 1755.* He describes it merely as a mountain of very rich ore, situated in a sandy track, of which the sand is extremely fine. He says, that bones of animals, as of stags and other kinds, are found frequently imbedded in the sand. No iron ore is found beyond the mountain. It appears, he says, as if the mountain had been artificially laid upon the sand; for it has no roots, and does not penetrate into the ground.

Bergman, in his Physical Geography, gives a similar account of

* Vol. xlix. p. 30.

Taberg. I have no doubt that he derived his information from the preceding account of Ascanius.

The next writer on the subject is Daniel Tilas, who published his description of Taberg in the Memoirs of the Swedish Academy of Sciences for the year 1757. It contains several excellent observations; but having been written before rocks were properly classified, no inferences can be drawn from it respecting the formation to which Taberg belongs.

The next person who surveyed Taberg was Napioni. His letter to Werner on the subject was published in the Miner's Journal for 1789, together with some remarks of Werner himself. Napioni was not able to determine the formation to which Taberg belongs in a satisfactory manner; but he inclines to the opinion that it is a mass of the newest floetz trap, impregnated with iron ore. This opinion Werner likewise embraces.

Hisinger published his Mineralogical Geography of Sweden in 1808. He considers Taberg as a mass of primitive greenstone impregnated with iron ore. But he takes no notice of the sandy basis of the mountain, which seems to present an insuperable objection to that opinion. According to him, this ore yields $32\frac{1}{2}$ per cent. of iron; and, upon the authority of Bergman, he affirms, that the iron obtained from it is of excellent quality.

The only other description of Taberg, with which I am acquainted, was published by Haussman, in 1811. His account appears to be the result of a careful examination. He adopts the same opinion with Hisinger, and considers the sand at the bottom as nothing else than decayed gneiss. I shall give an abstract of his description, as it contains several particulars that deserve to be known, and as the work of Haussman, published in Germany only last year, is not likely to have fallen into the hands of many of my readers.

"The obscurity and contradiction visible in the different descriptions of Taberg excited my curiosity to examine it, and I had that satisfaction on the 28th of July. The road at first was the same as that

to Bornarp; but we soon left that road on our left hand, and went up a narrow crooked path, often watered by a small rivulet, which runs from the foot of Taberg to the lake at Iönköping. The mountains which constitute this valley are not high: they are for the most part covered with pines and birches, though here and there a ploughed field occurs. They consist of broad foliated gneiss, similar to that of the hills at Iönköping. After some time the road leaves this valley, and passing to the left, ascends the acclivity of a hill, and proceeds along an elevated plain covered with underwood, and containing on it a small lake. Here Taberg first presents itself to the eyes, overtopping all the neighbouring hills, having the appearance of a large, insulated, long-backed mountain; on the left precipitous and bare, on the right sloping more gently and covered with wood, and having a hollow in the middle. A little farther on you come into the valley which separates the east side of Taberg from the neighbouring rising grounds. Through it the rivulet Mansarpa runs; and in it are situated the huts of the miners. Suddenly the iron mass of Taberg presents itself to your view, lying in the direction of north north-west and south south-east, and in height, according to the measurement of Peter Elvius, 400 Swedish feet two inches;* or, according to the estimate of Tilas, 420 feet above the rivulet of Mansarpa, at its south-east end. In this part the interior of the mountain is exposed by an almost perpendicular wall of rock, which constitutes the eastern side of the hill, entirely destitute of vegetation; and huge masses of rock, tumbled down, lying at its foot. The other sides of the hill are less steep, and are covered with wood. There is a plain on the top, in the direction of the north north-west, not, however, without interruption; for there is a valley that stretches itself towards the north-east, and which gives the hill, at a distance, the appearance of being double-topped. Its sides are covered with turf and wood. From this height a great part of Smoland may be seen, which stretches itself out under the eye as an immense forest, interrupted here and

* The Swedish foot is nearly the same as the English.

there by small lakes. On the north side the eye catches the great expanse of the Vetter, and the town of Iönköping at its side.

" The whole southern precipitous face of the hill consists of a solid mass of magnetic ironstone. Viewed from some distance, you cannot perceive in it any regularity of structure; but when you ascend the rock, you soon perceive that it has a particular direction inclining to the south, and dipping west at an angle of between 70° and 80°. These principal clefts are penetrated by other smaller ones inclining to the north-west, and dipping to the south-west at an angle of between 50° and 60°. The blocks of rock which are formed by means of these clefts vary in thickness from a foot to several yards.

" The magnetic ironstone of Taberg is compact, with an uneven fracture; but it exhibits very different qualities according as it is more or less mixed with other minerals. Here and there it is found pure, in small pieces; but is almost always mixed with hornblende and felspar. This mixture gives it a peculiar character, by which it may be distinguished at the first glance from the magnetic ironstone in all the other mines of Sweden. It deprives it of part of its lustre, and gives it a brownish colour, which becomes the stronger the longer the ore has been exposed to the air. The felspar sometimes occurs in crystals, and gives the mineral a porphyritic appearance. These crystals are sometimes large, and are frequently found united in spots and nests. The felspar is of the common kind; but is distinguished by a smoke-grey colour, passing into clove-brown.

" Between the different blocks into which this rock is divided there are layers of calcareous spar and bitter spar, from the smallest size to the thickness of several inches. These layers are often separated from the rock by thin beds of leek and dark-green serpentine. The serpentine is sometimes mixed with the calcareous spar and bitter spar, and there occurs occasionally between these beds a remarkable mineral called *greenearth* in Sweden, but to which I have given the name of *picrolite*. Its constituents, according to my analysis, are carbonate of magnesia in combination with silica and some oxide of iron. It exhibits a concealed, soft, concentric, fibrous texture. It has a twofold

cleavage. Its fracture is conchoidal; its colour dark leek-green, passing into mountain-green. Internally its lustre is glimmering and silky, but when scratched by the finger the lustre is waxy. It is translucent on the edges. Streak-white. Semihard. Difficultly frangible. Its natural joints are parallel to the sides of the rock in which it is deposited.

"On the eastern acclivity of the mountain there are several large blocks of greenstone.

"The ironstone of Taberg, on the south-east and east side, is quite irregular; partly from the many loose blocks, and partly from the way in which it has been blown up by gunpowder. It is more valuable on account of its tractibility, and the absence of every hurtful ingredient, than on account of the great quantity of iron which it yields. This varies from 21 to 32 per cent. In the hopes of finding richer ore, a shaft was driven into the mountain; but these hopes not being realized, the labour was soon abandoned. Three distinct kinds of ore are distinguished; rich ironstone (järnbänd), common Taberg stone, and stone penetrated with fragments of spar (skat and rispmalm). Taberg, which has been wrought since the year 1621, supplies all the furnaces in the district, to the number of fifteen, with ore. That it will continue to furnish a source of riches to the latest posterity, must be evident from the slightest view of its colossial mass.

"The valley on the right bank of the rivulet Mansarpa, as well as the high ground which is connected with the south side of Taberg, affords a good opportunity to examine the rocks with which that mountain is connected, and furnishes sufficient materials for determining the formation to which that mountain belongs. All these rocks consist of gneiss, which is not unlike what one meets with on the road from Iönköping, and which is mixed with beds that have a greater resemblance to mica slate than to gneiss. This variation is the natural consequence of the variation in the slaty texture, which is sometimes thick, and sometimes very thin slaty. In the thin beds I detected crystals of iron pyrites of an uncommon form. They consisted of rectangular four-sided prisms, terminated at the ends by

convex faces. They had the appearance of lengthened cubes. These crystals varied in size from half an inch to two inches. Where the gneiss approached the iron mass of Taberg, hornblende appeared mixed with it. The inclination and dip of this gneiss is the same with that of the iron ore of Taberg. The dip is west, and between 70° and 80°.

" These observations, together with the remarks made upon Taberg itself, seem to remove the doubts that have been hitherto entertained respecting the connection which exists between Taberg and the neighbouring rocks. *The mass of Taberg consists of greenstone mixed with much magnetic ironstone imbedded in gneiss rocks of immense extent. The destructive action of the atmosphere and water on the gneiss by wearing it away, has converted this bed into an insulated mass, laid upon the primitive rocks.*

" That the gneiss once stood as high as the top of Taberg, and probably higher, I think evident, from finding greater and smaller blocks of gneiss upon the summit of Taberg, lying on the grass. The prodigious quantity of sand, reaching from the side of the mountain as far as Sligamo and Bornarp, and filling the valley of Iönköping, may be mentioned as a further proof of the ancient height of the gneiss, which formerly enclosed the greenstone and iron of Taberg within it."

Such is the account of Taberg given by Mr. Haussman, and such the conclusion which he draws from his examination. I must confess that he appears to me rather to have cut the gordian knot than to have untied it. The great difficulty in determining the geognostic situation of Taberg results from the bed of fine loose sand which appears to constitute its bottom. Now of this bed he takes no notice whatever. I examined it with great care. It was full 30 feet thick, and, as far as I could determine, from the minutest inspection, it fairly passes under the iron ore. We are perfectly certain, that it was formerly covered with iron ore to a certain extent; for a part of the south-east side of the mountain has been removed to supply the iron furnaces, and the sand has been found below it. Now how is it possible to reconcile Haussman's conclusion with the matter of fact? Will it be believed that loose sand constitutes a bed among primitive rocks? If the account

of Ascanius be true, that petrifactions have been found in this sand, the opinion is still more untenable. On the other hand, if we conceive the summit of Taberg to consist of floetz greenstone, impregnated with magnetic ironstone, there will be nothing extraordinary in its resting upon sand, as the same thing has been observed in other places. This, therefore, seems to me the only conclusion which can be adopted. It coincides with the opinion of Napioni, and with the inferences which Werner drew from Napioni's description; and agrees perfectly with the preceding descriptions of Ascanius, Tilas, and Bergman. Hisinger, indeed, is of another opinion; but he supports his conclusions by no proofs whatever.

# CHAPTER XVII.

## JOURNEY FROM IÖNKÖPING TO HELSINGBURG AND GOTTENBURG.

Stages to Helsingburg—Appearance of Smoland—River Laga—Extensive Heath—Beech Trees—Ädelfors—Account of Helsingburg—The Sound—Zealand—Account of the Coal Mines at Höganäs—Geognostic Constitution of Sconia—Chalk found in it—Öland—Gottland—Stages from Helsingburg to Gottenburg—Nature of the Country—Embark in the Packet for England.

I LEFT Iönköping about one o'clock on Wednesday the 7th of October. This delay was owing to the slowness of the artificer whom I had employed to mend my unfortunate carriage wheel, which had given way so often, and been such a source of vexation to me during the greater part of my journey. The slowness of the Swedish workmen is very disagreeable to a man in a hurry or upon a journey. It seems to me to be every where alike, and to be quite incompatible with the nation ever becoming eminent for its manufactures; as they will always be undersold by their more industrious neighbours.

I was very much amused at one part of the charge of my landlord at Iönköping. I had gone to Taberg in a one horse cart belonging to him, and had taken my servant along with me. When he presented his bill, I found he had charged me exactly the same price as if I had taken two horses. Upon asking the meaning of such a charge, I was gravely told that by the laws of the country I ought to have taken two horses; that he had violated these laws out of friendship for me; but I could not expect on that account that he should deprive himself of the sum

of money to which he would have been entitled if I had taken two horses. This was such a whimsical argument, and delivered with so much coolness, that there was no resisting it. I could not but be struck at this surprising proof of friendship in my Iönköping landlord, to allow me to drive ten miles up hill and back again with one horse, and then to make me pay the price of two.

From Iönköping to Helsingburg I travelled across the whole province of Smoland, the worst peopled part of Sweden, and suffered a good deal of vexation from the length of time that I was obliged to wait at every stage for horses. I had been warned of this circumstance at Stockholm, and advised to employ a forbod all the way from Iönköping to Helsingburg. This advice I neglected to follow, and I suffered for my negligence. I would advise future travellers, who take this direction, by no means to set out without sending a forbod to bespeak horses for them at every stage, as by that precaution you get on without any delay, avoid a great deal of very tiresome sauntering, and by being much sooner at your journey's end, travel upon the whole nearly as cheap as if you had not employed any forerunner.

My stages on this journey, which was almost due south, and which took me two days and a half, were the following:

| | Swedish miles. | English miles. |
|---|---|---|
| Barnarp | 1 | $6\frac{2}{3}$ |
| Byarum | 2 | $13\frac{1}{3}$ |
| Skillingyrad | $1\frac{1}{4}$ | $8\frac{1}{3}$ |
| Kläfshult | 1 | $6\frac{2}{3}$ |
| Väramo | 2 | $13\frac{1}{3}$ |
| Tonno | 1 | $6\frac{2}{3}$ |
| Dörarp | $1\frac{1}{2}$ | 10 |
| Ljungby | 2 | $13\frac{1}{3}$ |
| Hamnedal | $1\frac{5}{8}$ | $10\frac{5}{6}$ |
| Traheryd | $1\frac{1}{2}$ | 10 |
| Morkaryd | 2 | $13\frac{1}{3}$ |
| Carried over | $\frac{7}{8}$ 16 | $112\frac{1}{2}$ |

| | Swedish miles. | English miles. |
|---|---|---|
| Taken up .... | $16\frac{7}{8}$ ..... | $112\frac{1}{2}$ |
| Fagerhult ..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Örkeljunga ..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Östra Ljungby .... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Ostorp ..... | 1 ..... | $6\frac{2}{3}$ |
| Helsingburg ..... | 2 ..... | $13\frac{1}{3}$ |
| | $25\frac{1}{8}$ | $167\frac{1}{2}$ |

The country rises almost all the way to Barnarp: it is sandy. There is a small lake at Barnarp, and a church built in 1687. Taberg is seen very distinctly from this place, and far over-tops all the neighbouring eminences. Nothing can be a more striking proof of the great flatness of Sweden than the considerable figure which a hill only 420 feet high makes. It is dignified with the name of mountain, and is as conspicuous in the situation in which it is placed as some of the greatest mountains of Europe are in theirs.

The road was mended with iron slag, and we saw heaps of Taberg ore, limestone, and slag, lying along the road. The limestone was granular, foliated, white, and obviously primitive. On inquiry I learned that it was brought for the smelting of the iron ore from some distance north, on the west side of the Vetter, at a place which my informer called Witta; but he could not describe its position with any thing like precision. Perhaps the place may be Vettack, which lies on the west side of the Vetter, nearly opposite to Falköping.

The country rises for about 13 miles from Iönköping; after which it becomes exceedingly flat, and full of small lakes. Few or no rocks are visible *in situ*; but the whole country is plentifully scattered with immense blocks and small stones, almost all gneiss or hornblende; though I saw likewise a few specimens of mica slate.

At Tonno we cross a pretty large river, for Sweden, called Laga. It struck me as very much of the size of the river Earn in Scotland. Over all the Swedish rivers bridges either of wood or of stone are erected, and you always pay a certain sum by way of pontage on

crossing them. These are the only turnpikes in Sweden. Here the pontage was nine stivers. The road continued for some time along the banks of this river, and we crossed it a second time farther to the south. I asked the name of it of the postboy, merely to discover whether he knew it. His answer was, that he could not tell what its name was; another proof of the little importance attached to rivers in this country. This river falls into the Cattegat at Laholm. So that we afterwards crossed it a third time on our way to Gottenburg. At Tonno begins a pretty large lake, through which the Laga flows. The eastern bank of this lake, along which we drove, is well cultivated, and filled with very large oaks, and plenty of birches, but very few pines.

At one part of the forest we saw a piece of ground in which the trees were burnt down. It was absolutely covered with great blocks of gneiss of various sizes. Yet we were told that this spot had been pitched upon by a peasant in the neighbourhood, that he had burnt down the wood, and that it was his intention to sow it with rye. How it could be possible to plow it, or where the soil was in which the rye was to grow, would have puzzled most farmers to determine. At Dörorp I tried the temperature of this lake, and found it 52°. The day was cloudy, windy, and felt rather cold. Indeed the temperature of the air was not higher than that of the lake. This lake was surrounded with a border of round water-worn stones about eight feet thick: a proof that the lake had sunk so far in its dimensions.

The whole road from Dörarp to Ljungby is through a heath, covered with erica vulgaris, at first thick scattered with birch bushes, but afterwards as bare as any heath in the highlands of Scotland. This heath for some time was flat, but as we advanced south it became very uneven, being thick set with knolls. The road was sandy and heavy, and the whole heath, as far as I could judge, seemed to be composed of nothing but sand. There is, however, a good deal of moss in the neighbourhood; for the fuel here is peat. I saw several stacks of it near the side of the road. This muir continued with very little interruption to Fagerhult; the dullness of the scene being now and then a

little relieved by small patches of cultivated land on the banks of the Laga, which still continued to accompany us. Indeed this cultivated district is nearly confined to the neighbourhood of Berga kyrka. To the south of Fagerhult, though the heath still continues, and the road is as sandy and hilly as ever, yet the country changes its appearance, being covered with wood and variegated with lakes. Here I saw the beech tree growing in great abundance and of a large size. I had never observed this tree in any part of Sweden farther north than Fagerhult. This kind of country continues till we come near to Östra Ljungby. Here, after passing the small river Milatota, the country becomes level, is covered with corn-fields, and looks rich and well cultivated. Most of the fields were unenclosed, though some few of them were surrounded by stone dykes. The whole heath was covered with loose blocks of gneiss; but when we came to the flat country the greater number of these disappeared.

We did not reach Helsingburg till half after one on Saturday morning, the 10th of October, and got into an inn with some difficulty. I was surprised when the girl of the inn, the only person who was up, addressed me in English, which she spoke with great fluency. She informed me that, about ten years ago, she was in the service of an English gentleman in Helsineur, and with him went to Edinburgh, where she resided six weeks. This was all the opportunity she had of acquiring our language; yet she spoke it with perfect propriety and correctness, and her accent was quite that of an English woman. Nothing can afford a more striking proof of the facility with which the Swedes acquire the English language than this example of a girl who, from the situation in which she was, could have no other means of picking it up but her ear.

Before proceeding to the description of Helsingburg, I shall give a short view of the geognostic structure of Smöland, as far as I had an opportunity of observing it.

The whole of Smoland is primitive, and consists of the same gneiss formation which covers East and West Gothland, and, indeed, the greatest part of Sweden. In the gneiss there occur beds of quartz, of

felspar, and of primitive trap. I myself saw beds of hornblende, and Hisinger mentions beds of primitive greenstone in the eastern parts of Smoland. Some beds of mica slate and of primitive porphyry (hornstone porphyry) likewise occur, but in no great abundance. The whole country is exceedingly sandy, and it is not improbable that the greatest part of this sand has proceeded from the decomposition of the gneiss rocks.

The most remarkable spot in the province, next to Taberg, is Ädelfors. It lies east and by south from Iönköping at the distance of about 53 English miles. This place was wrought as a gold mine, in consequence of the recommendation of Von Swab. The working began in 1738, and was continued till about 1789, when, in consequence of the small quantity of gold obtained, compared with the expense of working, it was abandoned. The rock in which the gold occurred is a bed of mica slate, which runs nearly east, and becomes gradually narrower. It lies in gneiss, which may be distinctly traced both on the north and south side of the mica slate. The gneiss on the north side the Swedes from its colour call *red granite*, that on the south side *gray granite*. The gold is said to have occurred sometimes native; but it was chiefly found mechanically mixed with an iron pyrites which abounds in the mica slate. This mine is of some value in a geognostic point of view, by giving us a well authenticated example of the kind of rock in which gold occurs. It is most commonly found in alluvial soil; but has obviously been washed down from older rocks. In the rocks at Ädelfors, however, it is necessary to state, that the gold occurs in veins not in the rock itself. The vein stone is calcareous spar, &c.

There is a mineral which occurs in Adolphus Frederick's grufva at Ädelfors, which does not appear to have been hitherto attended to by mineralogists. It colour is greyish white. Its fracture exhibits a glimmering lustre, with here and there the appearance of luminous streaks. It does not strike fire with steel. When heated in a spoon it phosphoresces like fluor spar, exhibiting a yellowish green light. It phosphoresces likewise when struck with a hammer. The light is then yellowish. Specific gravity 2·584. When exposed to the blow-pipe

the edges melt into a colourless glass. With borax it melts into a colourless glass. Its constituents, according to the analysis of Hisinger, are as follows:

| | |
|---|---|
| Silica | 57·77 |
| Lime | 35·50 |
| Alumina | 1·83 |
| Oxide of iron, with some manganese | 1·00 |
| Volatile matter | 0·75 |
| Loss | 3·15 |
| | 100·00 |

Such is the account of this mineral given by Hisinger. As I did not see any specimens of the mineral in question myself, I can make no additions to it.

There are several copper mines in Smoland: the ore as usual in Sweden is copper pyrites. The iron ores in this province, and in Skonia, are often obtained from the bottom of lakes, and consist of bog-iron ore; the very worst kind of ore for the purpose.

Helsinborg is a small and very irregular town, lying on the very margin of the Sound. The ground behind it rises rapidly, forming a bank of about 50 feet in height: between this bank and the sea the town is built. It is difficult to form a correct idea of its population, in consequence of its great irregularity; but I should not conceive that it can contain above 2000 inhabitants. Like all other Swedish towns, it has its square or market place; though here it is no wider than a good street. Helsingborg seems to have no trade whatever. There is indeed a pier which runs out a considerable way; but there was not a single vessel within sight, except a galliot from Hull, which lay at anchor at a little distance. This vessel had sailed from Hull loaded with horses for Petersburgh. She had parted from convoy, and had been under the necessity of running into Helsingborg to avoid the Danish gun-boats. Here she was lying with a party of Swedish soldiers on board to protect her, and quite uncertain how to act. Sometimes proposing to endeavour to get to Landscrona, and sometimes to

Gottenburg; but afraid to attempt either from the chance of being taken by the Danish gun-boats, which were swarming in that part of the sea.

The distance between Helsingburg and Elsineur, on the coast of Zealand, or the breadth of the Sound, is three English miles. Elsineur was seen very distinctly, and the castle of Cronberg on the west side of it, which had the appearance of a large square house, with four turrets of unequal size rising from its top. The water of the Sound is very transparent, and its bottom a light coloured sand. The deepest side is next the Swedish coast, so that vessels may sail through the Sound in spite of any endeavours of the Danes from their coast to prevent them. This was verified in the memorable passage of the Sound by the British fleet in 1801. Though the Danes kept up a constant fire, our vessels sustained very little injury. Elsineur used to be, next to Copenhagen, the place of greatest commerce in ~~Sweden~~; but the scene is sadly changed at present. I could not distinguish a single vessel in the harbour. The war with Great Britain has completely annihilated the whole trade of Denmark; and this is doubtless one reason of the inveterate hostility to this country which they have displayed. Indeed I was told in Sweden, and have reason to believe the information accurate, that the inhabitants of Zealand were provoked, not because the British had taken possession of that island, but because they had evacuated it. They would have very readily agreed to allow the British to keep it, and would have contributed to its defence, because then they would have retained their trade which is now at an end.

The coast of Zealand is low and sandy, and the interior of the country as far as I could observe it, is well wooded. The Danish coast forms a striking contrast with the Swedish coast in this place, which is bold and naked. When you walk along the shore of the Baltic, you do not see the great quantity of sea-weed so abundant on our coast. A single fucus or two was all that I could perceive. Nor is there any of that smell which is so perceptible on the coasts of Great Britain and France, which I conceive to proceed chiefly from the sea-weed. This difference is owing, I imagine, to the small quantity of salt which the

Baltic contains. It tastes sensibly brackish at the Sound; but not so much so, but that I could drink it without any inconvenience. Its temperature on the 10th of October, I found 54°.

The neighbourhood of Helsingborg being the only coal country in Sweden, I had gone thither on purpose to examine it. The extent of this coal district, and indeed the constitution of the whole province of Skonia, will be best seen by consulting the geognostic map of that province, which has been copied from the original of Baron Hermelin, and constitutes Plate XII. In travelling over the surface of this coal-track nobody would ever suspect its real nature. It is quite flat, partly muir, and partly cultivated, and the ground is thick strewed with round pieces of primitive rocks, such as gneiss, quartz, hornblende, and felspar. I could not perceive a single fragment of a floetz rock among them, after travelling through more than twelve miles of the country. But if you walk along the sea coast from Helsingborg towards Höganäs, you perceive the real structure of the country with great ease. The rock consists chiefly of sandstone, exactly similar to the sandstone which occurs in Great Britain, in the independent coal formation. In this sandstone you perceive the usual coal metals, slate-clay, limestone, bituminous shale, in beds. The coal has no great degree of thickness. Two beds of it have been found. The uppermost is one foot in thickness, the undermost $2\frac{1}{4}$ feet. But there is a bed of stone in the middle of it, which makes it difficult to work it. I have given a view of this structure in Plate XIII., figure 8, in which the bituminous shale is confounded with the coal.

The existence of coal in this part of Sweden has been long known, and mines have been opened in various parts of the track. About the year 1790 there existed a coal mine at Bosarp, on the east side of Helsingborg. At present the only mine open is at Höganäs: it is the property of a Swedish company. It began to be wrought in the year 1797, and is under the direction of a Mr. Stafford, an English gentleman from Newcastle; who has introduced the Newcastle mode of working. There are no less than five steam-engines, which have been built on the spot under his direction. This I conceive to have been a

mistake into which he fell, and which must have cost the Swedish company a great deal of money. It would have been much cheaper to have got the engines made in England, and transported into Sweden. They would have been much better executed, and would have answered the purpose better. One of these engines has a cylinder of 72 inches. Such an engine must be equal to several hundred horses, power. It does not answer the purpose, and therefore is so much money thrown away. At any rate such an immense engine can hardly be necessary for a mine which is far from deep, and which is not wrought to any great extent.

The coal mine is thirty fathoms deep. Mr. Stafford bored to the depth of 80 fathoms without finding any more coal; though he passed through a bed of limestone. Trials have been made at the distance of seven miles from the pit, and the coal has been found to extend so far without any variation. The quality of the coal is by no means bad. It a good deal resembles the coal of Mid-Lothian in its appearance, or that which occurs in Yorkshire, in the neighbourhood of Sheffield. An immense quantity of it, which had been raised from the mine was piled up in the open air. None of the Swedes will purchase this coal; owing partly to the prejudices which they entertain against that kind of fewel, and partly to the high price which the Swedish company demand for their coal. When I was at Höganäs I was told that the price of the Swedish coal was two pounds sterling the chaldron. At Newcastle, the price of the very best coals does not exceed thirty shillings. To demand so high a price appears very unwise. In a country like Sweden where labour is cheap, and in a mine of so small a depth, they ought to be able to sell their coal much cheaper than the Newcastle coal, which is taken from an enormous depth at a much greater expense. The only way to introduce coal as an article of consumption in Sweden would be to sell it at a cheap rate. I was told by all the manufacturers in every part of Sweden, that they found it cheaper to import coals from Newcastle than to purchase Swedish coal. Even at Helsingborg, which is quite in the neighbourhood of the coal mine, I never saw any person make use of coals. Wood is universally preferred;

though as the neighbouring country is bare of wood, that article must be dear. All the coal of Höganäs goes to Denmark; for the Danes have entered into the war with Great Britain with so much zeal, that they have prohibited the importation of British coal with which they used formerly to be supplied; and as they cannot do without coal, they are under the necessity of giving a higher price for Swedish coal of an inferior quality: but such infatuation cannot be persisted in long; and as soon as the Danes return to a sense of their own interest, the Swedish coal must be either greatly reduced in price, or it must remain unsold. If the proprietors of the mine were wise, they would embrace the present opportunity of endeavouring to extend and secure their sale, by lowering their prices as much as possible. The fundamental maxim by which all mercantile people ought to direct their conduct, if they understood their own interest well, is to take small profits, and to secure an extensive sale.

The northern part of Sconia is primitive, and consists of gneiss rocks, the same as Smoland. But the whole of the southern part belongs to the class of floetz rocks. The neighbourhood of Helsingborg, for at least twenty miles square, belongs to the independent coal formation, and contains the very same beds that occur at Newcastle, in England. The eastern part of South Sconia is similar in its structure to the floetz track of Nerike and East Gothland, which has been formerly described. The lowest bed is a conglomerate, which gradually passes into sandstone. Over the sandstone lies a bed of alum-slate, and over the alum-slate a bed of limestone, which constitutes the highest bed of all. This structure is delineated in Plate XIII., fig. 9. Below Malmo there occurs a bed of chalk, containing as usual abundance of flints. Not having seen this track, I can give no account of its position with respect to the other rocks. The position of chalk is not yet well made out. As far as my examination of this rock in the south of England has gone, chalk always lies over sandstone, and between the sandstone and chalk, there is a bed of a kind of marl, consisting partly of sand and partly of chalk. I have not been able to make out the nature of the sandstone in a manner quite satisfactory; but am disposed, from

what I have seen, to suspect that it is the third floetz sandstone of Werner. By walking along the south coast of England, from Southampton towards Plymouth, the nature of this sandstone might be determined in a satisfactory manner.

At Andrarum, on the east coast of Sconia, there is an alum work, which has existed since the year 1637. The alum-slate contains crystals of pyrites and nodules of an impure sulphate of barytes, which, according to the analysis of Bergman, contains the following constituents:

| | |
|---|---|
| Silica | 33 |
| Barytes | 29 |
| Alumina | 5 |
| Lime | 3·7 |
| Sulphuric acid and water | 29·3 |
| | 100 |

Not far from this there is a lead mine: the ore is galena. It was wrought from 1724 to 1739, I do not know if it is wrought at present, but rather believe not.

On the east coast of Sweden, opposite to Smoland and Sconia, there are two islands, Öland and Gothland, the structure of which it may be worth while to mention. Öland is within a few miles of the coast, and is a long narrow island, being 90 miles long, and from three to ten miles in breadth. The whole of this island is composed of floetz rocks, and is exactly similar in its structure to the eastern part of Sconia. The lowest rock of all is sandstone: over this lies a bed of alum-slate, containing stinkstone and pyrites, and the uppermost bed of all of a considerable thickness is limestone. This structure is represented in Plate XIII., fig. 10.

Gothland lies a little to the north of Öland, and farther east, being situated, as one may say, in the middle of the Baltic. It is a high island, its mean height above the sea being nearly 200 feet. Like Öland, the whole of this island consists of floetz rocks. Only two beds have been observed. The lowest of these is sandstone, and the upper-

most limestone, so that the alum-slate which occurs in Öand, and in almost all the floetz districts of Sweden, is wanting in this island. The structure of Gothland is represented in plate XIII. figure 11.

While I was at Helsingborg, the news of the entrance of the French into Moscow, and the burning of that city by the Russians, arrived. This intelligence seemed to have produced an effect upon the Swedish government; but to what their measures tended it was difficult to conceive. An order arrived to examine the passports of all foreigners, and to seize those who were not properly provided with such papers. I was accordingly obliged to produce mine for the first time since I had left Stockholm. It was stated also at Helsingborg, that an order had been issued for all Frenchmen to leave Sweden; but I can hardly believe that any such order was issued, at least publickly; first, because there were very few Frenchmen in Sweden, and secondly, because the Crown Prince had shown, by his previous conduct, that he did not mean to risk a rupture with Bonaparte, while the fate of Russia remained doubtful. The Danes were obviously alarmed at the preparations of Sweden; for though the threatened expedition was laid aside, they had stopped the passage of the Sound, and would not permit any person from Sweden to go to Copenhagen. They permitted them, indeed, to land at Elsineur; but they were not at liberty to leave that city, and go farther into Zealand; and after staying a certain time there, they were obliged to return again to Sweden.

On Sunday, the 11th of October, I left Helsingborg for Gottenburg, about 11 o'clock. The weather, for several days, had been cloudy and dull, but warm. I was afraid of rain. Luckily, however, it continued fair till I reached Gottenburg; but the next day a heavy rain fell for several hours, and the rainy weather continued, with little intermission, all the time I remained in that city. The road from Helsingborg to Gottenburg lies along the coast, though seldom within view of the sea; and constitutes one of the barest and worst cultivated tracks of all South Sweden. My stages were as follows:

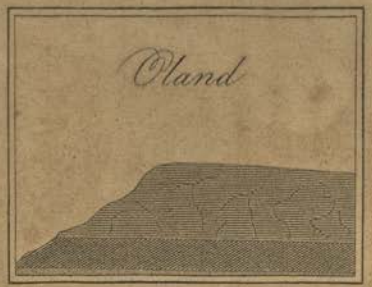
2

6

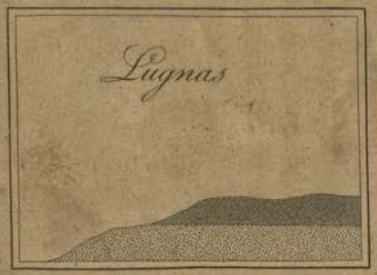
10

3

7




11

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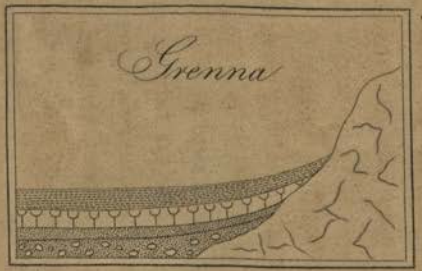
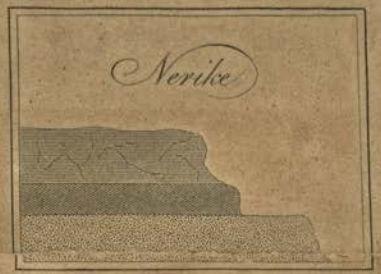
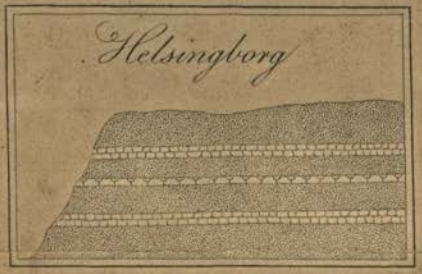



8

12



# Geognostic Structures of different parts in SWEDEN.

Engraved by J. Shury for D.r Thomsons Travels in Sweden.—Published May 1, 1813.

| | Swedish miles. | English miles. |
|---|---|---|
| Flemminge..... | 1 ..... | $6\frac{2}{3}$ |
| Engenholm..... | $1\frac{1}{2}$ ..... | 10 |
| Margretetorp... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Karup ..... | $1\frac{1}{9}$ ..... | $7\frac{5}{12}$ |
| Kärby ..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Halmstad..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Quiville..... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Sloinge..... | $1\frac{1}{2}$ ..... | 10 |
| Falconberg..... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Morup ..... | $1\frac{1}{4}$ ..... | $8\frac{1}{3}$ |
| Warberg ..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Backa..... | $1\frac{7}{8}$ ..... | $12\frac{1}{2}$ |
| Osa ..... | $1\frac{1}{2}$ ..... | 10 |
| Konsbacka..... | $1\frac{3}{4}$ ..... | $11\frac{2}{3}$ |
| Kärra..... | 2 ..... | $13\frac{1}{3}$ |
| Gottenburg .... | $\frac{3}{4}$ ..... | 5 |
| | $23\frac{2}{9}$ | $154\frac{11}{12}$ |

This journey took me two days and a half; so that I did not reach Gottenburg till about ten o'clock on Tuesday evening. The first night I stopped at Karup; for the nights were so very dark, and the road so bad, that I thought it hazardous, considering the frail state of my carriage, to venture to travel much after sun-set. Most part of the road from Helsingborg to Karup was an uncultivated muir, without trees; though here and there we passed through woods of birch, oak, alder, and willow, but containing no pines. This heath continued, with little intermission, all the way to Gottenburg. It is only necessary to observe, that between Helsenborg and Gottenburg there are seven small towns, and round each of these there is always a track of cultivated country. The whole country consisted of low ridges of gneiss rocks, which here and there put on the appearance of granite, and were remarkable for their beauty. But the greatest part of this track belonging to the province of West Gothland, its geognostic

structure has been already described, in the third chapter of this work.

I was obliged to stay in Gottenburg from Tuesday to Sunday, and passed my time very agreeably with my hospitable friends in that city. On Sunday, the 18th of October, I went on board the Lord Nelson packet, Captain Deane; and, after a stormy passage of a week, landed at Harwich early on Monday morning, the 26th of October.

# CHAPTER XVIII.

## CONCERNING LAPLAND.

Boundaries—Climate—Woody Lapland—Subwoody Lapland—Subalpine Lapland—Alpine Lapland—Height of the Mountains—Temperature of inland Lapland; of maritime Lapland—Temperature of the Earth—Vegetation—Table of the Plants that grow at different Heights—Effect of Snow on Vegetation—Plants of the western Coast analogous to those in Iceland and Scotland—Those on the east Side to those in Siberia—Number of Species of Plants found in Lapland—Minerals of Lapland.

IN the preceding chapters I have stated the result of my own observations on those parts of Sweden which I visited. A wish to give as complete a view of that country as possible induces me to add a few observations on the northern provinces which did not come within the range of my journey; and I begin with Lapland, which is the most northerly, and the largest of all.

Lapland constitutes the northern part of Scandinavia, and extends from about north latitude 64° to the Northern Ocean, occupying an extent from north to south of rather more than seven degrees of latitude, or about 500 English miles. Its breadth may be estimated at about fifteen degrees of longitude, or 300 English miles. For a degree of longitude, in latitude 67°, does not exceed twenty-seven English miles in length. This large track of country belongs partly to Russia, partly to Sweden, and partly to Denmark. To Russia belongs all the track of country to the east of the river Torneo, which runs

nearly due south, and falls into the Gulf of Bothnia, at the town of Torneo, in about north latitude 65° 40′. A narrow strip of Lapland, along the west and north sea-coast, belongs to Denmark. It is divided into Norland, West Finmark, and East Finmark. All the interior part of the country, on the west side of the river Torneo, belongs to Sweden. It is divided into four provinces; namely, Umea Lapmark, Pitea Lapmark, Lulea Lapmark, and Torneo Lapmark. Umea Lapmark is the most southerly, and Lulea Lapmark and Torneo Lapmark the most northerly. The Swedes formerly possessed Kemi Lapmark, which lies upon the east side of the river Torneo; but by the last treaty of peace it was ceded to Russia.

The climate of this extensive country does not depend upon its latitude so much as upon its height above the surface of the sea. The Gulf of Bothnia, which extends northward to nearly the sixty-sixth degree of latitude, equalizes the climate of all the countries situated around it; so that Torneo is just as hot as Umea, though the one lies two degrees farther north than the other. Dr. Wahlenberg, who made four different journeys through Lapland, who traversed it in every direction, and who spent the greatest part of several years in that remote country, has given us a minute and curious account of the position and temperature of the different parts of Lapland, both in his Flora Laponica, lately published, and in his *Geographical and Economical Description of Kemi Lapmark*, published in 1804, in Stockholm, by Baron Hermelin.

He divides Lapland into five parts, lying in zones concentric with the Gulf of Bothnia, distinguished from each other by their climate, and this climate depends partly upon their distance from the Gulf of Bothnia, and partly upon their elevation above the level of the sea. It is proper to mention, that Lapland does not reach quite so far as the Gulf of Bothnia. The country immediately in the neighbourhood of that Gulf is inhabited by Swedes and Finlanders. The general breadth of this zone, immediately bordering on the Gulf of Bothnia, may be estimated at fifty miles. But at Torneo, immediately at the northern extremity of the Gulf, its breadth is not less than 100 miles. Imme-

diately behind this lies the first and most valuable zone of Lapland, which Wahlenberg distinguishes by the name of *Woody Lapland.* It extends obliquely round the Gulf of Bothnia, from north latitude 64° to nearly 69°, and constitutes a zone about eighty miles in breadth. Though in some places, as a little to the west of the river Torneo, its breadth does not exceed thirty miles; while in Kemi Lapland, its breadth amounts to nearly 140 miles. This zone is covered with forests, consisting of the spruce fir *(pinus abies)* and the Scotch fir *(pinus sylvestris.)*

Behind this lies the second zone, which Wahlenberg denominates *Subwoody Lapland.* It extends from latitude 65° to nearly 70°, and is in general very narrow, not more than six or eight miles in breadth, except two pretty extensive tracks, the first stretching from Gellivare, in latitude 67° 20′, to Enontekis, in latitude about 68½°; the mean breadth of which is about thirty-six miles: the second surrounds the lake Enare, in latitude 69°, and is about 52 miles in breadth, including the lake; which, however, occupies the greater part of the space. This zone is higher, and consequently colder, than the woody zone. It contains Scotch fir; but the spruce fir does not grow in it.

To the third zone Wahlenberg gives the name of *Subalpine Region.* It lies immediately behind the preceding, and, like it, stretches from latitude 65° to latitude 70°. Its mean breadth is about twelve miles; though in some places, as to the north-east of Enontekis, it is three or four times as broad. This zone is higher than any of the preceding: the birch grows in it, but none of the pines. To the fourth zone Wahlenbergh gives the name of *Lower Alpine Region.* It lies immediately behind the third zone, and is nearly of the same breadth. It is much higher than any of the preceding zones. The only tree that grows in it is the *salix glauca,* a species of willow not found in Great Britain, and peculiar to very cold climates. The fifth zone is farthest distant from the Gulf of Bothnia, and, on the north side of Lapland, extends to the sea. Wahlenberg calls it the *Higher Alpine Region.* Its breadth varies, but is nowhere very considerable; and it is so much indented by the sea, that it is not easy to determine how great

it is. This zone constitutes the most elevated track of country. A great part of it is above the line of perpetual congelation, and is, of course, covered with eternal snows, and unfit for the purposes of vegetation. No tree is to be found in it; but there are some hardy plants which vegetate even in these alpine regions, and lift their heads up in the few spots from which the snow has been melted.

The height of the three first zones of Lapland above the level of the sea is not considerable; though there are various mountains scattered through them, of a respectable size for a flat country. Thus, the mountain at Quickjock, in latitude 67° 31', is 1140 English feet above the level of the sea. Gillesnöle is somewhat higher. Wahlenberg considers the elevation of Pitea Lapland as somewhat greater, especially at the lakes Tjakelvass and Laisan. The whole of woody Lapland is so level, that scarce a mountain rises higher than 213 feet above the neighbouring plain. Torneo Lapland rises gradually towards the Lapland alps. Von Buch found the height of Palajoensuu, at the river Muonio, 1070 feet above the level of the sea. According to the barometrical observations of the Reverend Eric Grape, continued for three years, the church of Enontekis is 1429 feet above the level of the sea. The church of Jukkasjärvi is somewhat higher, according to the barometrical observations of Hellant. From the church of Enontekis the ground constantly rises till you reach the top of the Lapland alps; but so gradually, that you may go in a boat to the lake Kielesjärvi; which is in so elevated a situation, that the birch-tree is scarcely to be found in its neighbourhood.

From Enontekis the water runs to the Northern Ocean, in the direction of Kautokeino, which of course lies lower. According to the mensuration of Von Buch, the height of Kautokeino above the ocean is 1380 feet. The lake Enare seems to be at an elevation of about 426 feet. While Utsjoki, to the north of that lake, by which the rivers run to the Northern Ocean, is only 260 feet above the level of that ocean. Hellant found the elevation of the river Ounasjoki, near Ounastunturi, to be 831 feet. From all these facts it follows, that Torneo Lapland is the most elevated of all the districts. Kemi

Lapland is so low, that, in advancing through it to the Frozen Ocean, you never rise higher than 640 feet. It is remarkable, that in Torneo Lapland the spruce fir is not found at Enare, at the height of 960 feet; which does not amount to one half of the height of the Torneo Alps. This is probably owing to the vicinity of the sea. The wind blowing from the Frozen Ocean probably prevents this track of country, though much lower, from being hotter than the Torneo Alps. For the same reason, probably, the subalpine mountains of Sodankylä are totally destitute of wood, though their elevation does not exceed 1386 feet. Hellant found the mountain Ounastunturi, which is the highest of them all, to be 2058 feet above the level of the sea.

The ridge of the Lapland Alps, running through the southern part of that country, as high as the lake of Torneo, seems to retain nearly the same elevation. No part of it seems lower than 2132 feet above the level of the sea. Hence this ridge is never entirely destitute of snow, though it does not reach the point of perpetual congelation. The ridge of alpine mountains that pass through Umea and Pitea Lapmark seldom surpass the line of perpetual congelation. Nor is any other *glaciere* known in that quarter, except *Junkaren Soupts.* The highest mountains of all occur in the southern parts of Lulea Lapmark: of these, the highest is Sulitelma, which is the highest mountain of Lapland; and the northern part of it rises to an elevation of 6178 feet above the level of the sea. The whole of the mountain of Sulitelma is elevated 4903 feet above the level of the sea; hence it produces a prodigious *glaciere,* to which the name of Salajegna is given. This mountain lies a little to the north of latitude 67 degrees, and in the 34th degree of east longitude from Ferro, or the 16½ degree of east longitude from Greenwich. A little to the north of Sulitelma is another high mountain, called *Olmajalos;* the height of which is 5543 feet. On this mountain there are several *glacieres* distinguished by the names of *Olmajalosjegna, Linajegna,* &c. The *glaciere* of *Tulpajegna* is more remarkable for its size than its height, which does not exceed 4050 feet. Among these mountains, the coldest in all Scandinavia, as they rise 2771 feet above the line of

perpetual congelation, are inclosed the remarkable lakes *Virih-jaur* and *Vastinjaur*, to which no others within the alpine range can be compared, either in breadth or height, which amounts to 1862 feet. Hence these lakes may be considered as the centre of the alpine country of Lapland.

Perhaps, however, the mountains *Getsetjack*, *Pernitjack*, and *Ridatjack*, which lie to the north of these ridges, equal them in height. But at the lake of *Torneo trask*, from which the river Torneo rises, and which lies in latitude $68\frac{1}{3}°$, and east longitude from Greenwich 20° 30′, there is a kind of interruption in the alpine range. For the greatest height in that quarter does not exceed 1386 feet. The lake of Torneo itself, according to the observations of Hellant, is elevated 1279 feet above the level of the sea. Beyond that point the tops of some of the mountains are covered with snow; but there are no *glacieres*. The height seems to be greater at Kiglijarvi than at any other place. At the river *Alten*, which runs north from Kautokeino, we may say that there is an interruption in the range of alpine mountains. For Kautokeino, which may be considered as nearly the highest point of elevation, is only 836 feet above the level of the sea.

The hills, such as *Vorieduder* and *Rastekaise*, which rise beyond this point, may be considered rather as an appendage than as a part of the Lapland Alps. Hellant measured the height of *Rastekaise* and found it not more than 2878 feet. Yet this mountain is partly covered with perpetual snow.

The maritime Alps constitute all the western and northern part of Lapland. But the principal chain extends from the insular promontory of Lofloden and the western side of the gulf of Alten. This chain of mountains, quite separated from the Lapland Alps, consists of islands and promontories, so steep and high that their summits are often elevated above the line of perpetual congelation, and glacieres are sometimes met with immediately over the sea. *Jockel fjäll*, *Stjernö*, and *Sejland* constitute the northern extremity of this ridge, and are elevated 3731 feet above the level of the sea. The highest of all these mountains are the Alps of Lyngen, which rise to an elevation of 4264

feet, not much inferior to the height of the highest of the Lapland Alps. In the island of Hindöe, and both the islands Vogöe, the mountains not only rise above the level of congelation, but are covered with numerous glacieres. The rest of the coast of Lapland is very rocky, but scarcely contains any high mountains, if we except the promontory of Kunnen, on the south side of which there is a glaciere extending to the sea-shore. Wahlenberg found the top of the mountain *Strando* Fjället, near Kierringöe, 3198 feet above the level of the sea. On the north coast of Finmark there are no mountains but only hills of 1279 feet elevation, and not covered with perpetual snow. The promontories of eastern Finmark are very steep and rocky, and somewhat higher than the preceding, but their elevation does not exceed 2132 feet above the level of the sea.

Such are the facts respecting the height of the Lapland mountains, which have been ascertained by the observations of Wahlenberg, Hellant, and Von Buch. I shall for the convenience of the reader subjoin a table of the heights of the different mountains in Sweden and Lapland that have been measured above the level of the sea. These heights, like all the others mentioned in this chapter, are in English feet.

| Mountains. | Height. |
|---|---|
| Tunaberg | 920 feet. |
| Hunneberg | 548 |
| Kinnekulle | 920 |
| Syltoppen in Jämtland | 6652 |
| Oreskutan | 5308 |
| Svucku-fjället | 4536 |
| Quickjock | 1140 |
| Palajoensun | 1070 |
| Enontekis | 1429 |
| Kautokeino | 1380 |
| Sodankylä | 1386 |
| Ounostunturi | 2058 |

| Mountains. | Height. |
|---|---|
| Sulitelma | 6178 feet. |
| Olmajalos | 5543 |
| Tulpajegna | 4050 |
| Lake Vastinjaur | 1862 |
| Lake Torneotrask | 1279 |
| Rastekaise | 2878 |
| Jockel-fjäll | 3731 |
| Lyngen | 4264 |
| Strando-fjället | 3198 |

From the preceding observations the reader will be able to form a pretty accurate conception of the elevation of Lapland above the level of the sea. This elevation will enable us to explain the temperature of this vast and dreary country. For the temperature is well known to be chiefly regulated by the height above the sea. Almost the only accurate information which we possess upon this part of the subject we derive from Wahlenberg, who from his long residence in the country, and the constant attention which he paid to the subject, was enabled to collect much curious and interesting information respecting the climate of Lapland.

We have already observed that the latitude of the place has little influence upon the temperature, but that it is chiefly regulated by the distance from the gulf of Bothnia and the height above the level of the sea. The gulf of Bothnia and the alpine ridge of mountains which encircles it at a considerable distance, preserve a certain equality of temperature, and occasion the temperature at Umea and Torneo to differ very little from that at Muonioniska and Sorsele. That this is the case appears from a series of thermometrical observations made at Umea and at Ulea, the first by Næzen and the second by Juhlin, and published in the Memoirs of the Swedish Academy of Sciences. The following table exhibits the mean of these observations in both places for all the months of the year, reduced to the degrees of Fahrenheit's thermometer.

| | Umea. | Ulea. |
|---|---|---|
| | ° | ° |
| January | 11·66 | 7·66 |
| February | 15·32 | 14·58 |
| March | 23·07 | 14·22 |
| April | 34·00 | 26·19 |
| May | 44·00 | 40·69 |
| June | 55·27 | 55·16 |
| July | 62·87 | 61·56 |
| August | 56·68 | 56·66 |
| September | 47·44 | 46·49 |
| October | 38·12 | 38·73 |
| November | 24·50 | 22·66 |
| December | 11·17 | 13·59 |
| | 34·50 | 33·18 |

The principal difference between the temperature of these two places happens during the months of March, April, and May, during which months there is no vegetation, so that the difference has little effect upon the plants which grow in the respective places.

As the vegetation is the same in the more elevated zones, which lie at a greater distance from the gulf of Bothnia, we have no reason to doubt that the temperature is the same. Hence the thermometrical observations kept at Enontekis by the Rev. Eric Grape, and communicated to Dr. Wahlenberg by the Stockholm Academy of Sciences, will furnish us with the requisite documents for determining this curious point. These observations were kept, as Wahlenberg informs us, with great care. For the month of January they were continued during a period of five years, and for the other months during a period of three years, namely, 1802, 1804, 1805. The observations were made in the morning, at noon, and in the evening; but we do not know exactly the hours of observing. This is unfortunate; because upon that circumstance depends the accuracy with which they furnish us with the true mean temperature of the place. I believe that in general the ob-

servations kept at different places indicate a temperature somewhat higher than the true mean of the place. For they are generally kept only during the day; and the night when the thermometer is lowest of all is entirely neglected. Two observations made every 24 hours would be sufficient to give us the true mean, if one of them were made when the thermometer stands highest, or about two in the afternoon, the other when the thermometer stands lowest, which is believed at present to be just before sun-rise. But I am not acquainted with any table of observations kept upon this principle. Those who are furnished with a Six's thermometer may easily obtain the true mean by noting down the greatest cold in the night, and the height of the thermometer at two o'clock in the afternoon for a whole year.

From the observations kept at Enontekis, we learn, that during summer and autumn the temperature of the air is warmer at noon than in the morning, just as happens in milder climates. But during winter the very contrary takes place, the temperature of the air at noon is always lower than in the morning. Indeed we have no reason to expect that in that climate the temperature should be regulated by the time of the day. For as the sun does not appear above the horizon, it can produce no effect upon the temperature. The following table drawn up by Dr. Wahlenberg, from the register of observations kept at Enontekis, will serve to exhibit the variation of temperature in that place during the year.

| | Mean from the highest observations. | Mean from the lowest observations. | Mean from both. | Mean of the months. |
|---|---|---|---|---|
| | ° | ° | ° | |
| January 1 to 10 ..... | 2·62 ..... | — 7·24 ..... | — 2·29 | |
| 11 — 20 ..... | 5·54 ..... | — 3·64 ..... | 0·95 | |
| 21 — 31 ..... | 6·44 ..... | — 1·30 ..... | 2·57 ..... | 0·41 |
| Feb. 1 — 10 ..... | — 3·82 ..... | — 11·02 ..... | — 7·42 | |
| 11 — 20 ..... | 8·24 ..... | — 3·82 ..... | 2·21 | |
| 21 — 28 ..... | 7·34 ..... | — 0·22 ..... | 3·56 ..... | — 0·55 |

| | | Mean from the highest observations. | Mean from the lowest observations. | Mean from both. | Mean of the months. |
|---|---|---|---|---|---|
| | | ° | ° | ° | |
| March | 1 to 10 | 15·98 | 4·28 | 10·18 | |
| | 11 — 20 | 19·04 | 4·46 | 11·75 | |
| | 21 — 31 | 18·50 | 6·08 | 12·29 | 11·41 |
| April | 1 — 10 | 29·84 | 18·14 | 24·04 | |
| | 11 — 20 | 30·74 | 21.92 | 26·33 | |
| | 21 — 30 | 30·38 | 24·98 | 27·68 | 26·02 |
| May | 1 — 10 | 36·14 | 28·22 | 32·18 | |
| | 11 — 20 | 40·64 | 33·62 | 37·13 | |
| | 21 — 31 | 43·52 | 37·22 | 40·37 | 36·56 |
| June | 1 — 10 | 46·76 | 39·92 | 43·34 | |
| | 11 — 20 | 57·56 | 49·10 | 53·33 | |
| | 21 — 31 | 55·04 | 48·56 | 51·80 | 49·49 |
| July | 1 — 10 | 62.24 | 53·96 | 58·10 | |
| | 11 — 20 | 64·22 | 55·76 | 59·99 | |
| | 21 — 31 | 64·76 | 56·84 | 60·80 | 59.63 |
| August | 1 — 10 | 64·94 | 58·10 | 61·52 | |
| | 11 — 20 | 61·52 | 52·52 | 56·52 | |
| | 21 — 31 | 52·70 | 46·58 | 49·64 | 55·89 |
| Sept. | 1 — 10 | 47·66 | 38·84 | 43·25 | |
| | 11 — 20 | 49·10 | 39·92 | 44·52 | |
| | 21 — 30 | 40·82 | 34·34 | 37·58 | 41·78 |
| Oct. | 1 — 10 | 33·98 | 26·06 | 30·02 | |
| | 11 — 20 | 34·34 | 26·60 | 30·47 | |
| | 21 — 31 | 27·32 | 16·34 | 21·83 | 27·44 |
| Nov. | 1 — 10 | 21·74 | 14·18 | 17·96 | |
| | 11 — 20 | 19·63 | 11·50 | 15·56 | |
| | 21 — 30 | 7·36 | — 1·00 | 3·18 | 12·20 |
| Dec. | 1 — 10 | 6·98 | — 1·12 | 2·93 | |
| | 11 — 20 | 8·06 | — 4·54 | 1·76 | |
| | 21 — 31 | 3·56 | — 6·88 | — 1·66 | 1·01 |
| | Mean | 31·26 | 22·44 | | 26·85 |

Winter (months i. ii. and xii.) mean from the highest observations ..... 5°·04
Ditto from the lowest ..... — 4 ·38
Difference ..... 9 ·42

| | |
|---|---|
| Spring (months iii. iv. and v.) mean from the highest observations | 29°·80 |
| Ditto from the lowest | 19·89 |
| Difference | 9·91 |
| Summer (months vi. vii. and viii.) mean from the highest observations | 58·86 |
| Ditto from the lowest | 51·21 |
| Difference | 7·45 |
| Autumn (months ix. x. and xi.) mean from the highest observations | 31·33 |
| Ditto from the lowest | 23·00 |
| Difference | 8·33 |

Such a climate must be admitted to be very singular. The mean temperature of the year is 26°·85, and the mean of the month of February is — 0°·55, yet the mean temperature of the month of July is 59°·63. In consequence of this high temperature the country is not only capable of producing trees but even pot-herbs. This is exactly analogous to the climate of Siberia.

But there is another portion of Lapland which has a climate nearly similar to that of Iceland; namely, that portion which lies between the Lapland Alps and the sea, and which belongs to Norway. Here we find quite another progression of temperature. Here the heat is almost entirely regulated by the latitude of the place, provided always that the distance of the place where the observations are made be not great from the sea. For even in that country there are some valleys surrounded on all sides by mountains, which are pretty warm. The following table exhibits the mean temperature of the different months at Nidrosia, which from the similarity of situation must be nearly the same as that of Norwegian Lapland.

| | |
|---|---|
| January | 19°·58 |
| February | 26·06 |
| March | 20·66 |
| April | 34·38 |
| May | 50·81 |
| June | 59·76 |
| July | 64·96 |

| | |
|---|---|
| August | 59·45 |
| September | 53·87 |
| October | 39·25 |
| November | 27·57 |
| December | 24·53 |
| Annual mean | 40·06 |

We see from this table how much more temperate the winter is in Norwegian Lapland than in Swedish Lapland. Hence the mean temperature of the year is much higher; nearly as high indeed as it is in Upsala, seven or eight degrees farther to the south. Hence, the reason why the hazle and several other plants which are natives of more southern climates vegetate without difficulty in Norwegian Lapland. When we go very far north we find the winters indeed remaining comparatively mild, but the summers are too cold for the vegetation of most plants. This appears from the following curious table of the temperature of Mageröa, near the North-Cape, drawn up from the observations of Von Buch:

| | |
|---|---|
| January | 22°·08 |
| February | 23·16 |
| March | 24·71 |
| April | 30·02 |
| May | 34·07 |
| June | 40·14 |
| July | 46·42 |
| August | 43·70 |
| September | 37·62 |
| October | 32·00 |
| November | 25·75 |
| December | 25·74 |
| Annual mean | 32·13 |

Whoever will compare this table with that which exhibits the temperature at Enontekis, must be struck with the great differences between the temperatures of two places situated at no great distance from each other. We see the temperatures of Iceland and of the Siberian continent, at no greater distance from each other than two and a half degrees of latitude. Perhaps no other country can exhibit so striking a difference in so narrow a space: hence the reason why both the plants of Siberia and of Iceland are found in Lapland. Vegetation depends much more upon the heat of the summer than upon the cold of winter. For the earth during winter being covered by a thick coat of snow, the plants are protected from the action of the cold, and kept at a comparatively high temperature. Hence Enontekis, with a mean temperature of 26°·85, is much better calculated for vegetation than the neighbourhood of the North Cape, where the mean temperature is only 32°·13; because at Enontekis the mean temperature of July is nearly 60°, while at the North Cape it is only 46½°. Even some kinds of corn might ripen at Enontekis; but this is quite out of the question at the North Cape.

Dr. Wahlenberg has shown, by an accurate comparison, that in the Alps of Switzerland the temperatures do not resemble those of Swedish Lapland, but of the maritime coasts of that country. Thus the temperature of St. Gothard bears a striking resemblance to that at the North Cape. The mean annual temperature at St. Gothard is 30°·38; at the North Cape 32°·13. The mean temperature of July, at St. Gothard, is 47°·41, at the North Cape 46°·42. The mean temperature of February, (the coldest month) at St. Gothard, is 14°·36, at the North Cape 23°·16.

Thus it appears that Lapland in point of temperature may be divided into two regions; namely, the inland parts, and the maritime parts. In the first the winter is very severe, and the summer very hot; in the second the winter is comparatively mild and the summer cold. There can be no doubt that the temperature of the maritime parts of Lapland is regulated by that of the Frozen Ocean in its neighbourhood; while

the interior parts of the country are screened from the action of that ocean by the Lapland Alps, which form a circle round them.

It must be quite obvious that in those countries which are covered with snow for a considerable part of the year, the mean temperature of the air and of the earth must be very different. The fitness of such a country for vegetation does not depend upon the mean temperature of the air; but upon the temperature of summer, the only portion of the year when the vegetables are uncovered from snow, and exposed to the action of the atmosphere. It is very probable that the mean temperature of the earth, if it could be obtained in these places, would furnish us with a pretty good criterion for judging how far they are fit for the purposes of vegetation. Dr. Wahlenberg has been at considerable pains to collect facts on this subject, and these facts are so curious that I shall give an account of them here.

It has been ascertained that the mean temperature of the earth at Upsala is 43°·7, which is considerably above the mean temperature of the atmosphere in that country. At the town of Gevalia, where the *alnus incana* begins to grow, Wahlenberg found the temperature of the earth to be 41°·9; and at Kroppa in Vermeland, and near Obo in Finland, the temperature of the earth is 41°. Sundsvall, a town of Medelpadia, where the last *pyrus malus* ripens, enjoys a mean temperature of 39°·2. At the lake Tafvelsjon, between the town of Umeo, and the limit of Umeo Lapmark, where we lose the *calla palustris, veronica officinalis,* &c. the temperature of the earth is 37°·22. Wahlenberg found the temperature of the fountain Tegsnäs on the borders of Lapland, on the 5th of August, 36°·68.

At the village of Tonsele, in Umeo Lapmark, there are two fountains, the temperature of which on the 9th of July, and 3d of August was 35°·96. Another fountain at Storbacken, exhibited nearly the same temperature. Near *Sorselle,* in the same part of Lapland, there is a large and deep fountain running through the marsh called Räfvamyran, which in the month of July was found, two different times, of the temperature 35°·6. Another fountain at Risnäs, near the lake Vindelen, was of the temperature 35°·24. On the mountain Giworten,

where the last plants of the *betula alba*, or common birch, were growing, there was a fountain, the temperature of which was 34°·5. Another fountain situated higher up, and above the place where birches grow, was of the temperature 34°·16. Another fountain still higher, where the Andromeda Hypnoides began to grow, was of the temperature 33°·8 at the end of the month of July. Though the temperature of these fountains was not observed at different seasons of the year; yet if we attend to the lowness of their temperature in summer, and to the analogy of fountains in other places, we can have little doubt that they indicate very nearly at least the temperature of the earth from which they flow. They afford reason to conclude that the mean temperature of the earth does not reach the freezing point till we come to the line of perpetual congelation. Hence this line may be considered as the limit of all vegetation: above it no such thing as vegetation exists. But vegetables begin to grow immediately below it, and they increase in quantity and variety according to their distance from that line.

If this opinion be correct, we may conclude that the mean temperature of the earth at the church of Enontekis is 35°·06, or 8°·21 higher than the mean temperature of the air. Such a difference must appear very striking to a native of Great Britain, where scarcely any difference has been perceived between the temperature of the air and of the earth, and where we are accustomed to estimate the mean temperature of the air in every place by ascertaining the heat of the neighbouring springs. But there is no analogy between Great Britain and Lapland. No part of Great Britain is ever covered with snow during the winter, beyond a few days at a time; some of the high hills excepted. Hence the surface of the earth is almost constantly exposed to the influence of the air. It is not surprising therefore, or rather it ought to be expected, that the mean temperature of both should be the same. But in Lapland the earth is covered by a warm coat of snow for more than six months, and this snow is only removed by the thawing influence of summer. So that the earth in fact is exposed to the influence of the air only during summer; and in winter, when the atmosphere is very

cold, it is covered up from its influence by the snow. We need not be surprised, therefore, that the mean temperature of the earth is warmer than that of the atmosphere. The same thing will be found in Canada, Hudson's Bay, and all other countries in the same circumstances.

If we compare the temperature of the earth and atmosphere at the North Cape, we find a very different result from what happens at Enontekis. Hellant found the temperature of a pit of water at Vadsöa in the month of December, 35°·6. This is only 3°·47 above the mean annual temperature of the air. Now this is just what we should expect, because, from the neighbourhood of the sea, snow lies at the North Cape for a much shorter period than at Enontekis. The influence of snow in preserving the temperature of the earth, and thus rendering it fit for vegetation, will be illustrated by a few particulars respecting the climate of Enontekis.

About the middle of the month of September the leaves of the birch become yellow, and fall off. About the beginning of October the small lakes freeze over, the earth begins likewise to freeze, but it is speedily covered over with snow. After this period rain hardly ever falls in such abundance as to uncover the earth from the snow. Indeed during the whole winter scarcely a particle of the snow is dissolved; so that the smaller rivers are completely dried up. Nor does it begin to melt rapidly so as to feed the rivers till towards the middle of the month of May. About the end of May, a rapid change takes place. The rivers carry the ice to the sea in great quantities, and the surface of the earth is uncovered after having been wrapt up in snow for seven months and a half. But spring does not immediately commence. The Alpine snows must first melt and increase the rivers by their progress to the sea. This is accompanied by a cold wind, which keeps off the summer temperature. Summer now appears in all its glory. The birch is covered with leaves, and so sudden and prodigious is the change, that we appear all at once, transported from the pole to the equator.

Thus it appears that in these countries the temperature of the earth depends in a great measure upon the temperature of summer. The

vegetative and productive power of such a climate is solely derived from the summer, and is not in the least regulated by the cold of winter. Provided always, as is the case, that the plants of the country, such of them as are not covered up by the snow, are hardy enough to withstand the rigour of winter without being destroyed. Let us now consider the vegetative power of the climate of Lapland, which constitutes one of the most curious and important particulars respecting the climate.

The term *climate* in common language includes not only the temperature of the air, but the notion likewise of vegetation. Nobody would say that the climate of Enontekis is $5\frac{1}{2}^{0}$ colder than the climate of Mageröa, provided he were told that the former is covered with wood, while the latter is scarcely capable of supporting any vegetation at all. Yet $5\frac{1}{2}^{0}$ is the difference between the mean temperature of the air in the two places, and the difference is in favour of Mageröa. The summer temperature in fact constitutes climate as far as vegegation is concerned; because upon it depends the power of the country to produce vegetables. Both at Upsala and at Enontekis it is necessary that the thermometer be at $39^{0}$ before the ice gets loose from the banks, and is carried by the rivers into the sea. It must be at $46\frac{1}{2}^{0}$ before barley can be sown, and it must reach $53\frac{1}{2}^{0}$ before the birch puts forth its leaves. In all those countries where the mean heat of summer does not amount to $53\frac{1}{2}^{0}$, the birch cannot vegetate, even though the temperature of the winter be ever so mild. This is the case at the north Cape, and likewise at St. Gothard, in Switzerland. Other plants require a long rather than a hot summer. Wherever the mean temperature of the summer for three months does not amount to $47\frac{1}{3}^{0}$ there big will not ripen. This happens long before we reach Enontekis. Yet there are various trees which are satisfied with the short and warm summer of that country; for the birch and various species of willow vegetate and grow well even in more inhospitable parts of Lapland than Enontekis. The pines require a long rather than a warm summer; hence in Switzerland they ascend much higher than the birch. But the very contrary happens in Lapland, where the summer is much

shorter than in Switzerland. We know likewise that in the Andes the mean temperature during all the months of the year is wonderfully equable. Hence all the trees that require a hot rather than a long summer cease to vegetate there much farther below the line of perpetual congelation than in Lapland; while barley and other species of corn, which are satisfied with a temperature of 47° or 48°, provided it continue for a considerable time, advance much nearer the line of perpetual congelation than any tree whatever. From these observations it is evident that we can determine a climate much more accurately from the plants that grow in it than from any other mode.

Small plants in all parts of the world are found to vegetate in places where the summer temperature is too low for trees. Indeed the want of sufficient summer heat is the reason why trees do not grow in alpine regions, and not the violence of winds nor the rigour of winter. The birch affords a good evidence of this, where it grows upon the borders of the alpine regions. The inhabitants consider the summer to be a good one when the buds of the birch put forth five leaves, and when the buds only put forth three leaves they conceive the summer to be bad. Now in the borders of those alpine regions, where it is just ceasing to vegetate, it never puts forth more than three leaves, and the branches are very knotty. The *betula nana* never puts out more than three leaves from a bud; and as these leaves are small, they come to maturity in three or four weeks, provided the temperature be sufficiently high; and therefore in the Lapland Alps this tree ascends higher than any other; but in Switzerland it does not even approach the Alps, because the summer heat is not sufficient for its vegetation.

In this way we may explain the progress of vegetation towards the Alps. That different plants follow different progressions in different countries depends upon the heat or the length of the summer. Where the summer is hot, but short, certain plants, as the birch, will thrive; where the summer is long, but cold, other plants, as barley, will vegetate successfully. Hence it is of the utmost importance to observe the places where various plants cease to grow, not merely as an object of

curiosity, but in order to form an accurate notion of the nature of each climate. The various limits of vegetation are no where better seen than in the Alps of Swedish Lapland, especially in that part of it where the land rises slowly, as in Torneo Lapmark, especially in the parish of Enontekis. On the Norwegian side the land rises so rapidly that the termination of the different plants cannot be so well observed. I shall here insert the following very curious table, drawn up by Dr. Wahlenberg from his own observations in Swedish Lapland.

| Regions. | Height above the sea. | Temperature of the earth. | Upper boundary of Plants. | Lower boundary of Plants. |
|---|---|---|---|---|
| | | | Lichen lanatus, β<br>Gyromium proboscideum<br>Gyromium cilindricum<br>Polytrichum septentrionale<br>Ranunculus glacialis | |
| | | | Jungermannia concinnata<br>Andræa Alpina<br>Weissia cirrata<br>Polytrichum juniperinum<br>Saxifraga oppositifolia<br>Silene acaulis | |
| Limit of snow. | 3518 English feet. | 32° | Peltidea crocea<br>Ranunculus nivalis<br>Saxifraga nivalis<br>Diapensia Laponica | |
| Superior Alps. | | | Rheum diginum<br>Ranunculus pygmæus<br>Salix harbacea<br>Dryas octopetala<br>*Empetrum nigrum*<br>Cerastium Alpinum<br>Aira spicata and alpina<br>Stellaria cerastoides<br>Erigeron uniflorum | |
| | | | Alsine biflora<br>Pectuncularis hirsuta<br>Andromeda tetragona<br>Andromeda hypnoides<br>Rhododendron sapponicum<br>Polypodium hyperboreum<br>Campanula uniflora<br>Draba alpina<br>Gentiana glacialis<br>*Betula nana* procumbens | *Ranunculus glacialis* |

| Regions. | Height above the sea. | Temperature of the earth. | Upper boundary of Plants. | Lower boundary of Plants. |
|---|---|---|---|---|
| Superior Alps. | | | Veronica alpina | |
| | | | Gentiana nivalis | |
| | | | Alsine stricta | |
| | | | Pedicularis lapponica | |
| | | | Ophrys alpina | |
| | | | Potentilla nivea | Pedicularis hirsuta |
| | | | Rhodiola rosea | ——— flammea |
| | | | Lychnis alpina | Draba alpina |
| | | | Saxifraga aizoides | *Ranunculus nivalis* |
| | | | Lychnis apetala | Saxifraga nivalis |
| | | | *Astragulus* alpinus | Juncus arcticus |
| | | | ——— leontinus | |
| Inferior Alps. | | | Carex rupestris, All. | Rhododendron lappon. |
| | | | Draba muricella | Astragalus leontinus |
| | | | Anthoxanthum odoratum | Phaca montana |
| | | | Scirpus Bellardi | Campanula uniflora |
| | | | Carex microglochin. | Dryas octopetala |
| | | | Carex ustulata | Silene acaulis |
| | | | Bartsia alpina | Cerastium alpinum |
| | | | Aira flexuosa | Andromeda tetragona |
| | | | *Betula nana* erecta | Saxifraga oppositifolia |
| | | | Menziesia cærulea | Veronica alpina |
| | | | Arbutus alpina | Carex lagopina |
| | | 33°.8 | Rubus chamæmorus | Saxifraga aizoides |
| | | | Pteris crispa | Gentiana nivalis |
| | | | Trientalis europæa | Draba muricella |
| | | | Geum rivale | Salix myrsinites |
| | | | Epilobium alpinum | Andromeda hypnoides |
| | | | *Salix lanata* | Juncus arcuatus |
| | | | Solidago virgaurea | |
| | | | Trollius europæus | |
| | | | Lycopodium alpinum | |
| | | | Epilobium palustre | |
| | | | Salix hastata | Carex microglochin. |
| | | | Cornus suecica | |
| | | | Lychnis dioica rubra | Pteris crispa |
| | | | Carduus heterophyllus | Salix herbacea |
| | | | Tussilago frigida | Rhodiola rosea |
| | | | Salix arbuscula | Diapensia lapponica |
| | | | *Salix glauca* | |
| Subalpine regions. | | | Aira atropurpurea | |
| | | | Ranunculus lapponicus | |
| | | | Pedicularis sceptrum carol | |
| | | | Menyanthes trifolia | |
| | | | Comarum palustre | Azalea procumbens |
| | 1918 | 34°.5 | *Betula alba* orgyalis | Juncus spicatus |
| | | | Melampyrum pratense | Aspidium lonchitis |
| | | | Phaca frigida | |

| Regions. | Height above the sea. | Temperature of the earth. | Upper boundary of Plants. | Lower boundary of Plants. |
|---|---|---|---|---|
| Subalpine regions. | | | Carex capitata<br>Arundo lapponica<br>Euphrasia officinalis<br>Aconitum lycoctonum<br>Sonchus alpinus<br>Onoclea strutheopteris<br>Sorbus aucupania<br>Erica vulgaris<br>Epilobium angustifolium<br>Spiræa ulmaria<br>Prunus padus<br>*Alnus incana*<br>Festuca rubra | Juncus parviflorus<br>——— trifidus<br>Arbutus alpina<br>Menziesia cærulia<br>Lycopodium alpinum |
| Subwoody region. | 1279 | 35°.24 | Populus tremula<br>Linnæa borealis<br>Rubus idæus<br>Epilobium montanum<br>Tormentilla erecta<br>Veronica serpyllifolia<br>Ledum palustre<br>*Pinus sylvestris*<br>Rosa majalis, β | Sonchus alpinus<br>Angelica Archangelica<br>Ranunculus lapponica<br>Salix lanata<br>Phaca frigida *in septentr.* |
| Superior woody region. | 853 | | Convallaria bifolia<br>Carex leucoglochin.<br>Arundo phragmites<br>Salix pentandra<br>Carex globularis<br>*Pinus abies*<br>Scheuchzeria palustris | Aira atropurpurea<br>Viola biflora<br>Tussilago frigida<br>Thalictrum alpinum |
| | | 35°.6 | Subularia aquatica<br>Prunella vulgaris<br>Chrysanthemum inodorum<br>Trifolium repens<br>Plantago magor | Pedicularis lapponica |
| | | | Thalictrum flavum<br>*Salix myrtilloides*<br>Nymphæa lutea<br>Convallaria majalis | Salix glauca<br>Bartsia alpina |
| Lower woody region. | | 35°.96 | Nymphæa alba<br>*Trifolium pratense*<br>Vicia cracca<br>Salix versifolia<br>Lysimachia thyrsiflora<br>Alisma plantago<br>Scirpus palustris | Arundo lapponica<br>Tofjeldea borealis<br>Serratula alpina |
| | | 36°.68 | Crepis tectorum<br>Gentiana amarella<br>*Fragaria vesca*<br>Chrysanthemum leucanthemum<br>Scutellaria galericulata | Astragulus alpinus, *on the banks of rivers*<br>Salix myrtilloides<br>Lychnis alpina, *on the banks of rivers* |

| Regions. | Height above the sea. | Temperature of the earth. | Upper boundary of Plants. | Lower boundary of Plants. |
|---|---|---|---|---|
| Lower woody region. | | 37°.4 | Daphne Mezerium<br>Carduus palustris<br>Lysimachia vulgaris<br>Schænus albus<br>Rubus arcticus *baccifer*<br>Orchis bifolia<br>*Calla palustris*<br>Veronica officinalis<br>Festuca elatior<br>Carex stellulata<br>Myrica gale | Epilobium alpinum, *in cold fountains* |

There is a very singular circumstance which sometimes takes place in the Lapland Alps. When a colder summer than usual occurs, the snow in the alpine regions is not melted, but lies all the year round. Such an event proves destructive to almost all the plants in such a track. So that when the earth is exposed next summer by the melting of the snow, hardly any vegetation appears, and nothing is seen but the ruins of the vegetables that formerly covered the spot. Wahlenberg had an opportunity of observing a striking example of this in the year 1807 in Lulea Lapmark. The cold summer of 1806 had left the snow unmelted all the year. Nothing could be more dismal than the appearance in 1807. It was remarked by the Laplanders themselves. This misfortune is most apt to affect shrubby plants, as the andromadæ, azaleæ, and the empetrum itself. Hence these plants can only grow in places where the snow is so completely dissolved every summer as to allow the earth to get dry. The junci and various boggy grasses were completely destroyed. The plants which soonest recover themselves from such a misfortune are the *ranunculus glacialis* and *nivalis*, the *saxifraga nivalis*, *stellaris*, and *oppositifolia*. Hence these plants can approach nearer the line of perpetual congelation than almost any other. The only plants capable of resisting this lying of the snow for a whole summer are some *lichens* and *polytricha*: in particular the *peltidea crocea* was seen growing in abundance in such places. The *lichenes umbilicati* and some of the *imbricati*, as the *lichen stygeus*, are capable of vegetating upon stones which are not every year deprived of

heir snow. These plants, therefore, constitute the ultimate vegetables apable of growing in these dreary regions.

These disasters to vegetables from snow lying unmelted are much nore frequent in Norwegian than in Swedish Lapland. Norwegian Lapland is much more rainy than Swedish, and it is generally known hat in rainy summers more snow continues unmelted than in dry summers; because the heat is much less. By these rains the surface of he snow is sometimes converted into ice, a circumstance which lays waste the whole country. This frequency of rain is the reason why here are more *glacieres* in Norwegian than in Swedish Lapland. Siberia has always a dry summer. Hence the reason why there are no glacieres in that country. Plants which are not so much injured by the snow, as ranunculus, saxifragæ, &c. are much more abundant in Norwegian Lapland, than the andromedæ, and other shrubby plants, which cannot resist the destroying effect of the snow.

The preceding observations render it perfectly evident that the progression of vegetation is very different in different parts of Lapland, In the woody regions of Lapland, whether to the north or south, the plants follow exactly the same order. *Calla palustris* in Umea Lapmark is scarcely found beyond Tafvelsjör, nor beyond the upper Torneo in Torneo Lapmark. *Trifolium prätense* ceases to grow at Falträsk and at Kengirs. But in the southern Alps of Lapland, especially at Gillesnöle and Quickjock, there are certain deep alpine valleys which give birth to a different progression. Here not only the Scotch fir is found, but even various plants not at all alpine, which seem to have made their way into these regions from Norway.

In Norwegian Lapland the trees and larger shrubs follow the same order as in Swedish Lapland; but the herbs occupy either a greater or a smaller space. Succulent plants, such as *saxifragæ*, *silene acaulis*, &c. grow better on the Norwegian than the Swedish side, and of course cover a greater extent of ground, and approach nearer to the sea shore; but the hard plants, such as *andromedæ*, are confined within narrower limits in the Norwegian than in the Swedish Alps, and in general are only to be observed upon the very summit of ridges.

The plants on the western part of Lapland between the Alps and the sea have a considerable analogy with the plants that grow in Scotland and Iceland, while the plants found in greatest abundance in Swedish Lapland are more intimately connected with Siberia. Thus in Norwegian Lapland are found *hypericum perforatum, pteris aquelina, thymus serpillum, convallaria verticillata, campanula latifolia, narthecium ossifragum, blechnum spicans, fumaria bulbosa, veratrum album, sedum villosum, ranunculus ficaria, scrofularia nodosa, lotus cornicu-lata, anemone nemorosa, potentilla anserina.* Some Norwegian plants appear to have made their way through the alpine valleys of Umea and Lulea Lapmark, as the *carex alpina* and *atrata, saxifraga cotyledon, sedum annuum, salix myrsinites, glauca* and *herbacea, sorbus aucuparia, erica vulgaris,* &c. On the other hand, in Kemi and Torneo Lapmark there are found plants so completely Siberian that they do not even occur in Sweden, such as *phaca frigida, andromeda caliculata, pole-monium cæruleum, sonchus sibiricus, veronica longifolia.* Thus there is something peculiar in the vegetation of Lapland, both on the west side and the east.

Many botanists have travelled in Lapland for the purpose of ascertaining the plants which grow in that remote country. Linnæus, when a student at Upsala in 1732, was sent to Lapland at the expense of the Upsala Academy of Sciences. He traversed a very great extent of country, and some years after published his *Flora Lapponica*, in which he describes and enumerates all the plants that he observed in Lapland. His catalogue amounts to 534 species. But of these no fewer than 76 species must be omitted; because no person has been able to discover them in that country since the time of Linnæus, though many journeys have been undertaken on purpose. Dr. Smith, in his new edition of the *Flora Lapponica*, has added 55 new species; but there are eight of these which Dr. Wahlenberg does not consider as natives of Lapland. Hence the real number of species in the *Flora Lapponica* ought to be reduced to 507 species. Dr. Wahlenberg has lately published a *Flora Lapponica*, in which he has described no fewer than 1087 species, many of them new. So that he has enriched the

Lapland Flora with no fewer than 580 species. The distribution of these plants according to him is as follows:

The Snow Alps contain not more than 93 species of perfect plants. The Subalpine region contains 125 species, and among these only a very few shrubs and no trees. The Woody region is the richest, and contains about 313 species of perfect plants. Lapland, as might be expected, is rich in cryptogamous plants. The *lichens* (using the word as Linnæus did) amount to 207 species; the *musci* amount to about 200 species; the *fungi* to 94 species; and the *algæ* to 55. The grasses (including the *carices* and *eriophera*) amount to 102 species. There are no fruit trees. There are 26 species of trees, provided we reckon all the *salices* as trees, to which, however, they are not all entitled. These trees are the Scotch fir, the spruce fir, the birch, the alder, the poplar, the mountain ash, the bird cherry (a shrub), and 19 species of salices, or willows. The species of perfect plants found by Wahlenberg, in Lapland, amount to 496; the remaining 591 species are cryptogamous plants.*

As to the mineralogical structure of Lapland, we are not possessed of much accurate information, as it has never been traversed by any professed mineralogist. Linnæus indeed paid some attention to the rocks which he observed: but the science in his time had made so little progress, that it is not always possible to draw any correct inferences from his observations. It is probable that the greatest part of the country, like Sweden, is primitive. Linnæus obviously met with gneiss and mica-slate, both primitive rocks. We know that the country abounds in mines of iron just as Sweden itself does. I examined a good many specimens of these ores in the cabinet of the College of Mines at Stockholm, and found them all *magnetic iron ore*, the same which occurs so abundantly in Sweden. In the iron mine of Gellivare, which is situated in Lulea Lapmark, a little to the north of latitude 67°, and in 21° east longitude from Greenwich, Mr. Svedenstierna

* For the very curious account of the climate and vegetation of Lapland, contained in this chapter, I am entirely indebted to Wahlenberg's, *Introductio Geographica* to his Flora Lapponica, published at Berlin, 1812.

found crystals of zircon mixed with the ore in considerable quantity. He pointed them out to me in several specimens in the College of Mines. Copper mines also exist in Lapland; but from the nature of the climate, and the want of inhabitants, we can scarcely ever expect that these mines can be wrought with advantage. Baron Hermelin indeed formed a project of that kind, and carried it on for some time with that spirit for which he is so remarkable; but it ended in the ruin of his fortune.

There is a kind of catalogue of Lapland minerals at the end of Acerbi's Travels in Sweden; but it gives us no information whatever of the nature of the country, and has been obviously drawn up, or at least translated into English, by a person not in the least acquainted with mineralogy. This fondness of travellers to shine in every department of science is very much to be regretted. It has led to an infinite number of mistakes, and prevents us from being able to place much confidence in the writings of travellers in general. It would be easy to point out some British travellers, even of excellent talents, who have fallen into this blunder, and who, not satisfied with writing upon those subjects with which they are acquainted, have filled their books with topics about which they knew little or nothing.

# CHAPTER XIX.

## OF THE LAPLANDERS.

Number of Inhabitants—Conversion to Christianity—Huts and Tents—Food—Dress—Customs—Swiftness of Foot—Music—Thread—Diseases—Cures—Power of the Clergy—Treatment of Strangers—Marriages—Calendar—Stock of Rein-deer—Account of the Rein-deer—Dyes—Method of cementing Stone-ware—Method of Tanning—Description of the Sledge—Method of catching Ptarmagans—Linnæus' dismal Journey in Lycksele Lapland.

HAVING in the preceding chapter given the best account which I could procure of the climate, vegetation, and mineralogy of Lapland, it will be expected that I should make a few remarks upon the inhabitants of the country. I shall, therefore, devote this chapter to the subject: and here our best guides will be Linnæus, who spent several months in the country, and who related his observations with the greatest *naiveté*, and without any view to publication; and the Danish missionaries, some of whom resided in Lapland for nine or ten years, and had the fullest opportunity of making themselves acquainted with the customs and dispositions of the Laplanders.

The inhabitants of Lapland, as might be expected from the nature of a country incapable of cultivation, are very few in number, and do not, it is believed, exceed 60,000, scattered over an immense track of 150,000 square miles; so that the country does not furnish much more than one inhabitant to every three square miles. They may be

divided into two sets; those who inhabit the woody region, and those who inhabit the alpine country. The first have fixed habitations, such as they are. The second live in tents, and move from place to place, in order to procure food for their rein-deer. They have a language of their own, quite different from the Swedish, and likewise from the Finnish; though it bears some analogy to the last, sufficient to induce us to believe that the Laplanders have originated from the Finns. Indeed, colonies of Finlanders were invited to settle in Lapland during the course of the last century, and great encouragement held out to them, to the prejudice of the native Laplanders. But fortunately, in a country so thinly inhabited, it was hardly possible to do any thing which could seriously injure the natives. If they were prohibited from fishing in one river, they could have recourse to another; for, in a country so abounding with lakes and rivers as Lapland, in all of which prodigious quantities of fish occur, it was impossible for a few colonists to occupy every one.

The Laplanders long continued Pagans, and worshipped the various gods who were the objects of veneration in the north. Their conversion to Christianity cannot be dated much farther back than a century and a half. They are of a swarthy complexion; their hair is black and short; their mouth wide, and their cheeks hollow. They are for the most part short in stature; but have considerable bodily strength, and are remarkably swift of foot.

The mountain Laplanders construct their tents by means of six beams of wood meeting nearly at top, over which is spread a covering of walmal cloth. This tent is usually nine feet in height, and about twelve feet in length. A flap of cloth is left between two of the main beams, which opens and shuts by way of door. Within the tent are spread, on each side, skins of rein-deer, with the hairy part uppermost. On these the inhabitants either sit or lie; for, except in the centre, the tent is not high enough to allow them to stand upright. The fire-place is in the middle, consisting of a square inclosure of low stones, on which wood is burnt. There is a hole in the roof of the tent, to allow the smoke to make its escape; but, in general,

the tent is quite filled with smoke. This, in winter, is considered as a security against the cold; and in summer it is a security against the moskitoes. The back part of the tent, behind the fire-place, is partly filled with wood for firing, and partly occupied by the household furniture; which consists of kettles and pots made sometimes of brass, sometimes of copper, and sometimes, though very seldom, of stone. They have also some wooden bowls made of birch, and capable of holding about twelve quarts. They have no plates, but place their meat upon oblong boards. They have a kind of basket for holding their cheese, and a barrel for their liquid food. In the roof of the tent are two racks, on which cheeses are placed to dry, and some rennet bags, filled with milk, are suspended from them, for winter use.

Their most curious article of furniture is a kind of box, or basket, to which they give the name of *kisa*. It is of an oval form, and its bottom and sides are made of fir like a box. It is about a foot and a half long, a foot broad, and six inches deep, with a transverse opening in the bottom, to admit a part of the saddle of the rein-deer. The contents of this box are confined by a lacing of cords, that goes from side to side across the top. Two such boxes, weighing each about two pounds, are placed, like panniers, upon the rein-deer; for that animal cannot carry more than four or five pounds weight.

The Laplanders live chiefly on meat. A family of four persons consumes at least one rein-deer a week, from the time that the preserved fish become too stale to be eaten, till the return of the fishing-season. Now three rein-deer may be considered as equal to an ox. Whenever he can kill gluttons *(mustela gulo)*, squirrels, martins, bears, or beavers, he devours them without scruple. Almost the only Lapland quadrupeds upon which he does not feed, are the fox and the wolf. In times of scarcity they eat chaff, as well as the inner bark of the pine tree, separated from the scaly cuticle. They grind and bake it, in order to render it fit for food. The bark is collected at the time when the sap rises in the tree; and after being dried in the sun, is kept for winter use. They grind it into meal, bake bread of

it, and make grains to feed swine upon, which make these animals very fat, and save a great deal of corn.

The milk of the rein-deer is another article of food, of which they make much use. These animals do not give more than half a pint at a time; but their herds are so numerous, that they are able to collect a great quantity. Linnæus enumerates no fewer than nineteen ways in which this milk is employed as food by the Laplanders. As the catalogue is curious, I shall here transcribe it, for the satisfaction of my readers.

1. Fresh milk, of which a great deal is taken in the course of the day.

2. Fresh milk boiled.

3. Fresh milk boiled and coagulated with beer, which is called *ölost*. This is common in Sweden. I have eaten it frequently, and with considerable relish.

4. Sour milk deprived of its cream, coagulated, and capable of being cut.

5. Sour milk, eaten with its cream.

6. Butter made, as usual, of cream shaken till its oily part separates and floats.

7. Butter-milk. What remains after the butter is made.

8. Cheese made of fresh milk heated, coagulated with calves' rennet, then deprived of its whey, and dried.

9. This whey being boiled, the scum which rises is repeatedly collected, and called *walle*.

10. The remaining whey is used, instead of milk or water, in making bread.

11. The same fluid, kept for a long time till it becomes viscid, is preserved through the winter, and called *syra*.

12. The whey of cheese, boiled to a thick consistence, is called *mesosmör;* and, with meal, is added to the preceding preparation.

13. *Sötost*, or *sweet cheese*, is made of fresh milk boiled till it is partly wasted, and the remainder, of the thickness of pap or gruel, is eaten fresh.

14. *Mjölost*, meal cheese, is milk coagulated with rennet, mixed with meal, and boiled.

15. *Tatmjölk* is fresh milk poured on the leaves of butterwort *(pinguicula vulgaris.)*

16. *Servet milk*, napkin milk, is made by taking a quantity of sour milk just beginning to ferment, when bubbles are formed between the cream and the milk. This is cut across in various directions, and the thicker substance taken off and hung up in a napkin, that the liquid part may drain away. What remains in the napkin acquires a firm consistence, and is eaten along with fresh sweet cream.

17. *Gös-mjölk* is made as follows:—The butter-milk is set by in a tub till it begins to ferment, when about a third or fourth part of the quantity of fresh milk is added, the whole being allowed to work once more. A serum by this time is formed at the bottom, which is drawn off by means of a cock at the bottom of the vessel. A similar portion of fresh milk is then put to the remainder, and more whey is by degrees deposited. This practice is repeated from time to time for a fortnight; by which time the milk has acquired a thick consistency, and is excellent eating. There is a similar preparation to this which was formerly much used in Edinburgh, and which is still known there by the name of *Carstorphine cream.*

18. *Lapmjölk* is milk mixed with sorrel-leaves, and preserved till winter in the stomach of a rein-deer, or some other animal.

19. The milk of the rein-deer is placed in a cellar to prevent its quickly turning sour, in order to obtain more cream: if it freezes, they thaw it again.

The Laplanders boil their meat very thoroughly, and treat their guests with grease, by way of dainty, which is eaten with a spoon.

They are exceedingly fond of the *angelica sylvestris*, a plant which grows in abundance in every district of Woody Lapland, upon the banks of rivulets, and in moist shady places. Wherever the Laplanders find it, they devour it with great avidity. It is known among them by a great variety of names. The first year of its growth, they call the root *urtas*, and the leaves *fadno*. The second year the plant

is known by the name *posco*, or *botsk*. When the stalk is dried, or eaten raw, they call it *rasi;* that is, grass. They are likewise fond of the *sonchus alpinus*, a kind of small *sow-thistle* which grows in Lapland, among trees at the sides of rivers. The stem is milky, and very bitter; but, notwithstanding, is greatly relished by the Laplanders.

The Laplanders, like all rude nations, are very fond of spirits; and no bribe more acceptable can be offered them than a glass of brandy. All that they use is of course imported from Sweden or Norway. After they have laid hold of the mug, they dip their forefingers into the liquor, and rub a little on their foreheads, as well as on the middle of their bosoms. This they think will prevent the brandy from injuring either their head or their breast.

The common bread of Woody Lapland is made of barley and chaff, in the following manner:—After threshing, they sift the corn through a sieve which not only retains the corn and chaff, but likewise a portion of the straw. The whole of this is dried and ground. The rich grind the corn alone. The poor mix one third barley and two thirds chaff, or equal parts of barley and chaff, or one part of chaff and two of barley. The meal thus procured is moistened with cold water into a paste or dough, without being allowed to go into a state of fermentation, and without any yeast. The dough is well kneaded on a table; then small pieces of it are taken, and spread out upon a table by the hand, and a kind of trowel, till they become as thin as parchment. The upper side is then pricked all over with an instrument composed of a large handful of the wing feathers of ptarmigans, or partridges. The cake is now turned over by means of a very large shovel, and the other side of it is pricked in the same manner. The cake is finally baked in a kind of oven, which holds only one at a time; and a person is required to attend, in order to prevent it from being burnt. When the whole are baked, they are laid by, one upon another, in a large heap, till wanted.

Sometimes bread is made of the inner bark of the fir-tree. The bark, before it is used, is dried over a slow fire, to render it brittle.

It is then ground, and baked in the same manner as the barley bread. Most commonly it is not employed alone, but mixed with barley flour. I have seen cakes of this kind, though I never tasted them.

There is another kind of bread sometimes used in Lapland, made of the *calla palustris*, or water-dragon. The roots of this plant are taken up in spring, before the leaves come forth; and after being well washed, are dried either in the sun, or in the house. The fibrous parts are then taken away, and the remainder dried in an oven. Afterwards it is bruised in a hollow vessel, or tub, made of fir wood, about three feet deep. The dried roots are chopped in this vessel, with a kind of spade, till they become as small as oatmeal; after which they are ground. The meal is boiled slowly in water, being continually kept stirring, till it becomes as thick as flummery. In this state it is left standing in the pot for three or four days and nights. This makes it lose a certain bitterness and acridity which distinguishes it at first. It is mixed for use either with meal made of fir bark, or with some other kind of flour; because it cannot be procured in sufficient quantity to be used by itself. Such bread, when new, is exceedingly good.

In Norway, bread is usually baked either of rye, or of a mixture of barley and rye. But rye is not to be had in Lapland, where no other corn is raised but only a very small quantity of barley, and that only in particular spots. In times of great scarcity bread is sometimes made from the ground seeds of the *spergula arvensis*, or spurrey.

The Lapland women often do not suckle their children. They feed them with rein-deer milk, which they administer by means of a horn.

The dress of the Laplanders is as follows:—On the head they wear a small cap, made with eight seams covered with strips of brown cloth; the cap itself being of a greyish colour. Their outer garment, or jacket, is open in front, half way down the bosom; below which it is fastened with hooks, as far as the pit of the stomach. Consequently, the neck is bare; and, from the effects of the sun abroad, and the smoke at home, it approaches the colour of a toad. The jacket,

when loose, reaches below the knees; but it is usually tied up with a girdle, so as hardly to reach so far, and is sloped off at the bottom. The collar is of four fingers' breadth, thick, and stitched with thread. All the needle-work is performed by the women. They make their thread of the sinews in the legs of the rein-deer, separating them while fresh into slender strings, which they twist together. A kind of cord is also made of the roots of spruce fir.

The women wear several things attached to their belt; as a leather bag, containing a spoon, a tobacco-pipe, a knife, a thimble made of leather, a pincushion, and several brass rings. The belt itself is usually adorned with silver or tinfoil, and with pearls. The men wear a kind of bag hanging down exactly in front, and divided into two pockets. It contains their tobacco-pipe, tinder-box, tobacco, and a spoon made of rein-deer's horn, of an oblong flattish shape.

As a defence against wind and snow, a sort of hood, called *nialmiphata,* is worn over the cap. It is made of red cloth, of the shape of a truncated cone, dilated at the bottom; and is four palms high, three palms in circumference at the upper part, and six at the bottom. It covers the cheeks, as well as the neck and shoulders; the eyes and mouth only being exposed. In the back part, at bottom, is a loop, through which goes a riband, to secure the whole from being blown off, by being tied round the body under the arms.

In winter-time the women wear breeches, made exactly like those worn by the men. They likewise wear boots, which come up no higher than the knee. Their gloves are made of the skin taken from the legs of the rein-deer. Their hairy shoes are made of the skin from the forehead, between the horns, of the same animal. They never go barefooted; though, instead of stockings, they have nothing but dried *carex sylvatica,* which may be considered as a kind of hay. Sometimes they buy leather for their boots from their neighbours.

White *walmal* cloth is procured from Russia; but when they cannot get it, which is frequently the case, they wear a light grey cloth, of the same kind. Their snow shoes are made of wood. They are six

feet long, and about six inches broad in the middle, but at both extremities they taper to a point. The under part of the shoe is convex and furrowed lengthwise; the upper flattish, raised about an inch, and the edge all round is sharp. In the middle there is a place for the foot, with a band to bind the shoe firmly to the ankle.

The dress of the Laplanders is, in one particular at least, wisely contrived. Their thick collars effectually protect the throat and breast.

They make ropes of the roots of the spruce fir, in the following manner. Choosing the most slender roots, they scrape off the bark, while fresh, with the back of a knife, holding the roots against the thigh. Afterwards each root is split with a knife into three or four parts, which are then, by degrees, separated into a number of very slender fibres; and these being wrapt round the hand, like a skein of thread, are tied together. They are then boiled in a kettle for an hour or two, with a considerable quantity of wood ashes. While still soft from this boiling, they are laid across the knee, and scraped three or four times over with a knife. At last they are twisted into small ropes. Birch-roots are sometimes, though rarely, treated in the same manner, and converted into ropes; but they constitute the usual ingredient for basket work.

Little cleanliness can be expected from the Laplanders, if we attend to the nature of their climate, and the miserable habitations in which they live. They wash their dishes and their spoons with their fingers, squirting water upon them out of their mouths. Those who inhabit the woody country are dispersed in single families. They have more intercourse with their civilized neighbours, and on that account are inferior, both in honesty and good nature, to the Alpine Laplanders, who live in a kind of villages formed of tents, and move about from place to place, in order to procure food for their rein-deer.

The Laplanders are acquainted with no musical instrument except the *lur*, which is a sort of trumpet, and pipes made of the bark of the mountain ash. None of them sing at church, except those who are reckoned among the great or learned of the community.

It will be worth while to give a more particular account of their mode of making thread from the tendons of the rein-deer. In each hind-leg are two tendons, one before the other; in each fore-leg, one behind, and two or three before. These the Laplanders lay hold of with their mouths, split and moisten them, rubbing them from time to time with rein-deer marrow, in order to render them as supple as possible. Each string is made sharp at both ends, and drawn through holes of various sizes, in an instrument made on purpose, of wood or metal, to render it as fine and smooth as they can. Two such threads are then twisted together, by means of the hand, upon the thigh or knee. They are generally held with the left hand, and twisted with the right upon the left knee, proceeding downwards; the thread being moistened, from time to time, with saliva.

It is remarkable, that in Lapland all food is dressed by the men, and all articles of clothing prepared by the women. They are capable of walking or running a prodigious way without being fatigued. This must be ascribed to the nature of the country, to the roaming life which they lead, and to the constant care they are obliged to take of their rein-deer, an animal exceedingly swift of foot.

It is curious to know the diseases to which a people are liable, that lead a life so different from ours, and that are strangers to all the baneful effects of luxury and vice, so prevalent among the civilized nations of Europe. Fevers are very rare, and so is the small pox; which, from the great distance at which these people live from each other, cannot make its way through the community as it does in towns and populous districts. Hence, there are many Laplanders who have never had that disease, and who are liable to fall a sacrifice to it, when exposed to its infection. Intermittent fevers are rare; the coldness of the country counteracting the baneful effects of marshes and stagnant waters, in which Lapland abounds.

Swelled necks, similar to those that occur in Switzerland, and which are there known by the name of *goitres*, are frequent. They have been ascribed to the use of snow-water, but this must be a vulgar prejudice. It is much more likely that they are produced by something

peculiar in the dress of cold countries; since it is in them only that they abound.

Sore or *blear* eyes is a disorder almost universal among the Laplanders, and is to be ascribed to two causes, either of which would probably be sufficient to produce a disorder in the eyes. Their huts or tents are constantly filled with a thick cloud of wood smoke. Now every person that has ever been subjected to the influence of this smoke, knows that it is peculiarly acrid, abounding in the fumes of vinegar, and of an empyreumatic oil; both of which act upon the eyes with great energy, and occasion a constant smarting. This I conceive to occasion the blear-eyed appearance which distinguishes almost all the Laplanders. During seven months of the year, the ground is covered with snow; the glittering of which, and the great quantity of light which it reflects, has a pernicious effect upon the eyes, weakens them, and is the probable reason why many of the Laplanders become blind in their old age. The absence of the sun during a part of the winter no doubt diminishes this evil, though it does not remove it entirely.

Female obstructions are rare, though sometimes met with among the better sort of people. It is said that the *catamenia* are much more scanty in Lapland than in the southern parts of Europe. Female diseases from debility are unknown. There are even instances of women walking twenty-five miles to church within five days after being delivered of a child.

Hysterics sometimes occur, but very rarely. Epylepsy is more common. Head-aches are frequent; and deafness is a common disease of old people. A swelling or falling down of the uvula is not uncommon. They cure it by cutting off the part affected.

Coughs and colds are exceedingly uncommon, notwithstanding the coldness of the climate, and the small means which they have of guarding against it. Cases of consumption now and then occur, but by no means so frequently as in Great Britain. It would be of importance to know whether a greater proportion of children die in that country than here; because it would enable us to ascertain

whether the greater proportion of health which the Laplanders enjoy be owing to those of weakly constitutions dying in their infancy, or to their really having in general a stronger constitution than those nations among whom luxury and vice have made greater progress. I have little doubt that the first is the true cause, as it is of the great health which savages in general enjoy.

Pleurisies are common in spring and autumn; and lumbago frequently makes its appearance in summer. Asthma is not uncommon among old people; and cases of hoarseness now and then occur in winter and spring. Disorders of the stomach and bowels are not unfrequent; but they seldom last long. The stone, the gout, the jaundice, are entirely unknown to them. The absence of the stone deserves the attention of medical men. Some have ascribed this disease to the use of malt or fermented liquors; an opinion so far confirmed by its never appearing in Lapland, where fermented liquors are unknown. At the same time, reflexion will convince us that little stress can be laid upon such reasoning. Our knowledge of the Lapland diseases is necessarily very limited, being merely the information picked up by three or four medical men, during a journey through the country. The stone might easily have existed in Lapland without coming under their observation. The natives may be afflicted with the disease without ascribing it to the true cause. The existence of the stone in the inferior animals, even in those that go wild, and whose food, therefore, has not been altered by the interference of man, ought to prevent us from hastily ascribing the disease to any peculiar species of food. It is found both in graminivorous and carnivorous animals; though much more frequently, I believe, in the former than in the latter. We cannot, therefore, ascribe its absence among the Laplanders to their living on animal food almost entirely; though that may contribute somewhat, perhaps.

The great remedy which the Laplanders employ in most of their diseases is the actual cautery; a remedy much used by the ancient physicians, and still famous in Japan, where the substance employed for the purpose is called *moxa*. This substance, known in Lapland by

the name of *toule,* is made of a fine fungus found on the birch, and always chosen from the south side of the tree. Of this they apply a piece as large as a pea upon the afflicted part, setting fire to it with a twig of birch, and letting it burn gradually away. This is repeated two or three times. It produces a sore that will often keep open for six months; nor must it be closed till it heals spontaneously. This remedy is used for all aches and pains, the head-ache, tooth-ache, pleurisy, pain in the stomach, lumbago, &c.

Sometimes they apply a kind of plaster called *kattie,* which is made in the following manner. The fine loose scaly bark of the birch is set on fire, and immediately quenched in water. It is then chewed, and afterwards mixed with fresh turpentine from the spruce fir, both being kneaded together by the hands, till the mass becomes a black uniform plaster. This is successfully applied to hard imposthumes, &c. which it brings to maturity without pain, in a short time, and promotes their discharge.

The clergy have established a kind of despotic authority over the Laplanders. They do not oblige them, indeed, to go to church every day; but on all festivals, and days of public thanksgiving, they must either attend church, or be fined ten silver dollars, and do penance for three Sundays. On these occasions the poor Laplanders are obliged frequently to go to a distance of thirty or forty miles, and to wade through half-frozen rivers up to the arm-pits; so that they arrive in church half dead with cold and fatigue. What benefit they are likely to derive from attending church in such a condition I leave to the Swedish clergy to decide.

When the Laplanders expect any visitors, they are particularly careful to have plenty of *ris* (branches of the dwarf birch) spread on the floor, under the rein-deer skins on which they sit; otherwise they would be thought deficient in civility, and the mistress of the family would be censured as a bad manager, when the guests returned to their homes. Their mode of entertaining strangers is as follows. If the stranger arrives before their meat is set over the fire to boil, they present him either with iced milk, or with some kind of berries

mixed with milk, or perhaps with cheese, or with *kappi* (when milk is heated on the fire, the scum which forms on the top is taken off, and preserved in rein-deers' bladders; this is called *kappi*). Afterwards, when the meat is sufficiently cooked, and they have taken it out of the pot, they put into the water in which it has been boiled slices of cheese made of rein-deer's milk. This is a testimony of hospitality, and that they are disposed to make their guests as welcome as they can. They next serve up some of their dry or solid preparations of milk.

I shall now give an account of the way in which marriages are conducted in Lapland. The lover, in the first place, addresses his favourite fair one in a joking manner, to try whether his proposal is likely to be acceptable or not. Perhaps he even speaks once or twice to her father on the subject. He next takes with him such of his nearest relations as live in the neighbourhood; who, as well as himself, all carry provisions with them to the hut of his mistress. The lover always closes the procession. When the party arrive at the place of their destination, they all walk in, except the lover. If there be any other hut near at hand, the damsel usually retires to it, that she may not be obliged to hear the conversation of the visitors. Her admirer either remains at the outside of the door, among the rein-deer, or goes into some neighbouring hut. There are usually two or three spokesmen in the party, the principal of whom is called *sugnovivi*. When they are all seated, the young man's father first presents some brandy to the father of the young woman; upon which the latter asks why he treats him with brandy? He replies, "I am come hither with a good intention, and I wish to God that it may prosper." He then declares his errand. If the other party should not be favourably inclined to the proposal, he rejects it; at the same time thanking the person who made it. Upon this, all who are present endeavour to prevail upon him to give his consent to the marriage. If they succeed, or in case the offer has from the first been accepted, the friends of the lover fetch whatever they have brought along with them, consisting of various utensils, and silver coin, which they place on a

rein-deer skin spread in the hut before the father and mother of the intended bride.

The father or mother of the bridegroom then distributes the money between the young woman and her parents. If the sum be thought too small, they ask for more, and it frequently happens that much time is spent in bargaining before they come to a conclusion. When they cannot procure so large a sum as they think themselves entitled to, they often reject the whole, and return the money to those who brought it. But if matters are brought to a favourable conclusion, the parents allow their daughter to be sent for. Two of the bridegroom's relations undertake that office. If the bride has any confidential friend or sister, they walk arm in arm together; and in such a case the mother of the bridegroom is required to make a present of a few brass rings, or something of that kind to the friend or sister.

When the bride enters the hut, her father asks her whether she is satisfied with what he has done. To which she replies that she submits herself to the disposal of her father, who is the best judge of what is proper for her. The mother of the bridegroom then presents the bride with the sum alotted for her, laying it in her lap. If it prove less than she expected, she shows her dissatisfaction by various gestures and signs of refusal; in which case she may possibly obtain at least the promise of a greater sum: all these gifts become her own property.

When such pecuniary matters are finally arranged, the father and mother of the bridegroom present him and his bride with a cup of brandy, of which they partake together, and then all the company shake hands. They afterwards take off their caps, and one of the company makes a kind of prayer, begging for God's blessing upon the new married couple, and returning thanks to him who gives every man his own wife, and every woman her own husband. The parents of the bridegroom next partake of some brandy, and the whole stock of that liquor, which they had carried along with them, is brought out for the entertainment of the company. All the relations of the bridegroom then come forward with their provisions, which generally consist of some cheeses, and a piece of meat dried and salted. The latter is

roasted before the fire; while in the mean time the company is regaled with some of the solid preparations of milk, the bride and bridegroom eating by themselves apart from the rest.

Two stewards are next chosen, one of them from the bride's party, the other from that of the bridegroom. The last mentioned party are then required to furnish a quantity of raw meat, amounting to about a pound and a half to each person. This the stewards immediately boil, and then serve it round to all present. This meat is dressed in several separate pots, two only in each hut, if there be any neighbouring huts which can serve to accommodate the party on this occasion; for each Laplander has no more than one hut of his own. The fat part of the broth is first served up in basons. Afterwards various blankets of *walmal* cloth are spread upon the floor, by way of table cloth, on which the boiled meat is placed. The chief persons in the company then, as many of them at least as can find room, take their places in the hut of the bride's family, sitting down round the provisions, while the children and inferiors are accommodated in the neighbouring huts. Grace is then said. The bride and bridegroom are placed near together, for the most part close to the door or place of entrance. They are always helped to the best of the provision. The company then serve themselves, taking their meat on the points of their knives, and dipping each morsel into some of the fat broth, in which the whole has been boiled, before putting it into their mouths. Numbers of people assemble from the neigbourhood, to look in upon the company through the door; and as they expect to share in the feast, the stewards give them two or three bits of meat, according as they respect them more or less. What remains after every body is satisfied, is put together, and wrapped up in the blankets, that part of it which is left by the new married couple being kept separate from the rest, as no other person is allowed to partake of their share. The dinner being over, the whole company shake hands, and return thanks for their entertainment. They always shake hands with the bride and bridegroom in the first place, and then with the rest, saying at the same time *kusslan*.

After taking some brandy, the whole party go to bed. The bride and bridegroom sleep together with their clothes on.

When the company rise in the morning, if the bridegroom's father and their party have any thing left, they treat the others with it: for the family of the bride have seldom any preparation made, not being supposed to expect such company; and they never keep any brandy by them, but purchase it for every occasion. Whatever cold meat therefore remains is brought forward, to which the bride's party add cheese, and any other preparation of milk, that they may have in store. With these the party regale themselves by way of breakfast. Finally the family of the bride boil some fresh meat, as a last repast for their guests. After partaking of which they take their leave.

The banns are usually published once. The marriage ceremony, which is very short, is performed after the bridegroom's company have departed. This being over, the bridegroom either takes his wife immediately home with him, or he goes to his own hut alone and stays a few days; after which he returns to her residence, bringing with him his herd of rein deer, and stays for some time with her. Such of the Laplanders as are rich enough to afford it, make their wives a present of a coverlet, a petticoat made of cloth, a small silver cup, several rix-dollars and silver rings, a spoon, &c. So that many a bride costs her husband a hundred copper dollars. To her mother he perhaps gives a silver belt, as well as a cloth petticoat.

Among a nation so illiterate as the Laplanders, and where there is no occasion either to sow or reap, we cannot expect an accurate astronomical division of the year. They have no months at all; but time is divided by weeks, and they have names for all the festivals, their knowledge of the recurrence of which is no doubt derived from the clergy, who themselves obtain it from the Swedish almanacs. The following are their names for the days of the week:

| | |
|---|---|
| Sunday, | *Sotno peivi.* |
| Monday, | *Mannutaka.* |
| Tuesday, | *Tistaka.* |

Wednesday, *Kaska vacku,* or middle of the week.
Thursday, *Tourestaka.*
Friday, *Perietaka.*
Saturday, *Lavutaka.*

The principal festivals are distinguished by particular names. Midnight is called *kaskia.* The remainder of the night before dawn, *pojela kaskia.* The morning dawn, *theleeteilyja.* Sun rise, *peivi morotak.* Two or three hours after sun-rise, *areiteet.* The hour of milking the rein-deer, which is about eight or nine o'clock, *arrapeivi.* Noon or dinner time, *kaskapeivi.* About five or six in the afternoon, *eketis peivi.* Sun-set, *peiviliti.* Night, *iä.*

The riches of the Laplanders consist in their rein-deer, and in the extent of the ground on which they feed. The poorer people have from 50 to 200 of these animals; the middle class from 300 to 700, and the rich possess a thousand or more. The lands are from three to five Swedish miles in extent. Wild rein-deer are uncommon in Lapland. They chiefly occur on the common between Granoen and Lycksele. It very often happens that those whose herds are large, lose some of their rein-deer, which they generally find again in the ensuing season, and they then drive them back to their old companions. If they will not follow the herd they are immediately killed.

This animal feeds almost entirely upon the *lichen rangiferinus,* or rein-deer moss, which grows in prodigious quantities in Lapland, whitening whole districts of great extent. Sometimes in autumn, when there is no snow lying, a sudden frost freezes up this plant. When this fails, the animal has no resource, for he will not eat hay. His keepers fell the trees in order to supply him with the filamentous lichens that clothe their branches; but this kind of food does not supply the place of that which is natural to him. It is astonishing with what readiness he gets at his proper food through the deep snow that covers it, and by which it is protected from the severe frosts. The rein-deer feeds also on frogs, snakes, and even on the mountain rat (*mus lemmus*), often pursuing the latter to so great a distance as not to find its way back again.

The herds are driven home, night and morning, to be milked. A maid servant and a dog are sufficient to drive a whole herd. If the rein-deer prove refractory, the dog easily makes them obey the word of command, especially when seconded by the hissing of the woman, at which they are extremely terrified. In summer they are exceedingly fond of running against the wind. When indulged in this they run with great violence in hopes of finding a place to cool themselves. In hot weather they suffer dreadfully, and often refuse to eat.

They have a very considerable resemblance to stags. The head is grey, and blackish about the eyes; mouth whitish; nostrils oblique; tail short, not above six inches in length, obtuse, white, concealed between the haunches; feet encompassed with white above the hoofs; the whole body is grey, blacker when the new coat first comes on, whiter before it falls. The hair is not readily plucked off, but easily broken. The horns of the female are upright, or slightly bent backwards, furnished with one or two branches in front near the base, the summit sometimes undivided, sometimes cloven. Those of the male are often two feet and a half long, and their points are as far distant from each other. They are variously branched with more or less numerous subdivisions. They cast their horns every year; the males immediately after the rutting season, about the end of November; the females in May, after they have brought forth their young. If the females are barren it is known by their casting their horns in winter. The horns of the male scarcely differ from those of the females in general structure. Both are hairy, but the hairiness falls off before Michaelmas. At first they are flexible, and so very sensible that the animal can scarcely bear to have them handled. Under a narrow layer of cartilage the whole cavity is full of blood vessels. When arrived at their full growth the horns are bulbous at their root like those of a stag.

The length of the leg of the rein-deer, from the joint of the foot to that next the body is two feet. From this latter joint to the top of the back is also two feet; from the shoulders to the tail two feet; from the shoulders to the horns one foot, and the same from the horns to the

mouth. From the belly to the back, that is, the perpendicular measure of the trunk, is a foot and a half. As the rein-deer walks along a crackling noise proceeds from its feet. This is occasioned by the construction of the hoof. When the animal stands upon its feet, the hoofs are widely expanded, and their points most remote from each other; but every time the foot is lifted from the ground they strike together and occasion the noise.

When the rein-deer are driven to the place where they are accustomed to be milked, they all lie down, breathing hard and panting violently, chewing the cud all the time. When the fawn is missed by its mother, she runs in search of it with the most violent anxiety, stooping with her nose to the ground like a sow, till she finds it. She even quits the herd to which she belongs and seeks her young at the Laplander's hut.

After the herd has lain down, each of the people takes a small rope, and making a noose, throws it over the head of one of the females intended to be milked. The cord is afterwards twisted round the horns, and the other end tied to a small pole fixed in the ground. One pole is sufficient to secure four of these animals, which all hands are afterwards employed in milking, both master and mistress, men and maids. If the milk does not come with facility they beat the udder very hard with their hands, which causes a greater flow. The dugs are four, and sometimes six, all yielding milk. The young are not separated from their mothers, but to prevent them from sucking, they besmear the dugs with rein-deer dung.

The female rein-deer bring forth their young early in May, and their owners begin milking them on Midsummer day, and continue to do so till the beginning of November; though in the Alpine regions they leave off sooner. The fawns acquire horns the first year, which are perfectly simple like fingers. The size varies according to the age of the animal.

The mode employed by the Laplanders of castrating their deer is curious, and deserves to be related. When the animal is two years and a half old its owner, about a fortnight before Michaelmas, getting

a person to assist him by holding it fast by the horns, places himself between its hind legs. He then applies his teeth to the scrotum, so as to bruise its contents, but not so as to break the skin, for in that case the rein-deer would die. He afterwards bruises the part still more effectually between his fingers. The same operation is performed on both sides, at one time, if the rein-deer remains quiet long enough for the purpose. The animal is rather indisposed for a while, so that he can hardly keep up with the rest of the herd; but he usually recovers perfectly in a week's time.

The rein-deer are dreadfully tormented in hot weather by a kind of fly (the *oestrus tarandi.*) They cannot stand still an instant, but are continually changing their posture, starting, puffing and blowing. Ten or a dozen of these flies are sufficient to throw a whole herd of rein-deer into commotion. The fly pierces the skin of the rein-deer, and deposites its eggs. When they are hatched the insect makes its way through the skin. Hence when rein-deers are killed at the end of summer, their skins are much less valuable than at other seasons; being full of holes produced by these mischievous insects.

Though the rein-deer will not eat hay, they feed with avidity upon the great water horse-tail (*equisetum fluviatile*), even when in a dry state. It is obvious, therefore, that the Laplanders might lay up a store of this plant for the winter provision of these useful animals, and thus prevent them from being exposed to famine, when the rein-deer moss happens to be frozen up.

The rein-deer is liable to several diseases, some of which it may be worth while to enumerate.

Their hoofs are not uncommonly affected with a swelling at the edge where they are attached to the skin. An ulcer breaks out at this part which is seldom healed. The creature thus grows lame, and is unable to keep up with the herd.

They are sometimes attacked with a vertigo, or giddiness of the head, which causes them to run round and round continually. Those which run according to the course of the sun are conceived curable by the Laplanders; but those which run the contrary way are thought

to be incurable, and are therefore immediately killed. The cure for the former, practised by the Laplanders, is to cut their ears, so as to cause a great discharge of blood.

The *karbma,* or ulceration, produced by the gad fly (*oestrus tarandi*) takes place every spring, especially in the fawns. Such as are brought forth in the summer are free from this misfortune the ensuing spring, but in the following one many of them lose their lives by it. When come to their full size and strength, the consequences are less fatal; but no rein-deer is entirely exempt from the attacks of this pernicious insect.

The fawns are frequently afflicted with a soreness in their mouth, so as to be unable to eat.

Rein-deer are subject to a disease called by the Laplanders *pekke kattiata,* accompanied with ulcerations of the flesh, which however often heal by a sloughing of the part affected. This is an epidemic disorder. It is believed that if any of the ulcerous part, which is cast off, be swallowed by the animal, in licking his own coat, or that of any other of the herd labouring under this malady, it proves fatal by corroding the viscera.

The dugs of the female often become chapped and sore, so as to bleed whenever they are milked.

The male rein-deer in his natural state is fatter than such as are castrated, except the latter be kept without work, in which case they become the fattest. Such as are castrated and allowed to run wild become considerably larger, as well as tamer in consequence. The rutting season lasts but a fortnight, from about a week preceding the feast of St. Matthew (Sept. 21), to Michaelmas-day; during which period the male is savage and dangerous. Immediately afterwards he casts his hair and horns, and not unfrequently becomes so emaciated, that in many instances, death is the consequence. The females bring forth their young about the 18th May in the following year, or within a fortnight of that period, very rarely later. They do not copulate the first year, and seldom before the third, their progeny being found the better for this delay.

The fawn, whether male or female, is called the first year *mesk*; the second season the male is called *orryck*, and the female *whenial*. In the third year the latter, if she has been covered, is known by the name of *watja* or *waja*, which means a wife; if otherwise, she goes by the name of *whenial-rotha*, the three year old male being called *wubbers*. In his fourth year the male is termed *kaddutis*; in the following one, *kosittis*; in the sixth, *machanis*; and in the seventh, *namma lappatachis*. After that period no male is kept, they all perishing in consequence of the exhaustion above mentioned; but the castrated ones live to a more advanced age. None of these animals, however, survive their twelfth or fourteenth year. When the castrated males become very fat towards autumn, and show signs of old age; or the females have become barren, or appear otherwise to be on the decline, they are killed by the knife in the close of the year, from an apprehension that they might otherwise perish of themselves from infirmity, in the course of another season.

Such of the male rein-deer, as are destined to serve for a stock of provisions, are killed before the rutting time, and their carcases hung up to be exposed to the air and frost before flaying. The flesh is smoked and a little salted, and then laid upon sledges to dry in the sun, that it may keep through the winter till spring. About the 24th of February the rein-deer begin to be so incommoded by the gad-fly, that they are not in a fit condition to be slaughtered for eating. From that period, therefore, till the milking season the Laplanders are obliged to live upon their stock of preserved meat. At other seasons of the year the females are killed for immediate use according as they are wanted. The blood is kept fresh in kegs, and serves for food in the spring, being added to the *välling*, (a sort of gruel made by boiling flour or oatmeal in milk or water) with a small proportion of milk or water. The blood of these animals is thick in consistence like that of a hog. The Laplanders carry a portion of it along with them from place to place, in bladders or some kind of vessels. A stock of this and of all other necessaries is collected as late as possible before the melting of the snow, while there still remains a track for the sledges.

I have been thus minute in my account of the rein-deer, because they constitute in fact the sole riches, and almost the sole resource, of the Laplanders. Were it not for these useful animals Lapland would be uninhabitable. I shall now notice some of the arts or manufactures which exist among this rude people.

They dye their wool red chiefly with the bloodroot or tormentil, *(tormentilla erecta)*. A red colour is given to their leather by means of fir bark. The men wear a kind of trowsers, which reach down to their feet, and are tied round their half-boots so as to keep out water.

Their common method of joining broken earthen ware is to tie the fragments together with a thread, and boil the whole in fresh milk, by which they are cemented to each other.

They make an ointment for burns of fresh cream boiled to a thick consistence, with which the sore is anointed. It removes the pain, and promotes the healing of the ulcer.

They tan their leather with birch bark. The hides, after being plunged into warm water, are buried in some out-of-the-way corner of the hut, and taken up every day till the hair begins to separate, which is then scraped off with a roundish knife. The fresh inner bark of the birch, cut into small pieces, is then boiled in water for half an hour; in which liquor, when partly cooled, the skin is immersed. On the two following days it is taken out, the liquor warmed, and the skin replaced. Afterwards it is dried in the open air in the shade. This leather is much better and softer than that which is prepared by the Finnish colonists in Lapland, who will not, however, on that account, change their own process.

In winter the Laplanders travel in sledges drawn by rein-deer with prodigious velocity. Their sledge is made of birch wood, and like other sledges is drawn along the ground. The back part is upright, or nearly so, the lower part only being somewhat sloping inwards, and its form is roundish, the height a foot, the breadth a foot and a half. The body of the machine is like the hulk of a boat, with an obtuse keel, and consists of five longitudinal boards on each side, lying one over the edge of another; that which forms the keel being about an inch

thick, and lying flat like the others. Each board is not externally plain but convex, so that as the carriage is drawn over the snow it leaves several tracks or lines where it goes; the board which forms the keel only being quite flat. The boards which are fixed at one extremity, in a circular manner to the roundish board that makes the back, are collected by their points at the other, and all bound together by a rope; for there are no nails to fasten them. The whole carriage is six feet in length, and from the back part to within two feet of the front its breadth is all the way about four feet. From that spot the keel begins to curve upwards, and the transverse dimensions are contracted gradually to a point. This sledge is drawn by a rope that goes through a hole in the front of the keel. The edges or sides of the machine do not curve outwards, but rather inwards. When any covering is to be put on, which is always done in part when any person is to travel sitting in the carriage, and entirely from one end to the other, when it is intended to be used for the conveyance of goods, two or three semicircular or arch-like bows are erected, fixed by their ends within the edges of the carriage, which serve to support a covering of seal skin or cloth, whose margin next the back is loose, and so far distant from that part as to allow the traveller to sit upright, his legs lying under the cover, while the said margin is tied round his waist like an apron, serving to keep the snow out of the hollow part of the machine. The person of the traveller is further secured by strings fixed to the edges of the carriage, which lace around him across the top so as to prevent him from being thrown out by any oblique or unexpected movement. Each board, which composes the body of the sledge, is somewhat convex on the inside, but still the whole internal surface is sufficiently smooth and even. The point in front sometimes projects a foot beyond the hollow part.

The Laplanders use no almanac, but in its stead only a kind of instrument like the ancient runic callendar of the Goths, composed of seven small splinters or boards. The year begins by their reckoning on the Friday before Christmas day.

During a considerable part of the summer the Laplanders are em-

ployed in fishing. The rivers abound with fish in an enormous degree; so that they find no difficulty in catching as many as they think proper. These they hang up and dry, and preserve for future use. During this season they catch likewise some of the birds with which Lapland at that time swarms. Some of their contrivances for this purpose are ingenious enough. The following, for example, is the way in which they catch ptarmagans *(tetrao lagopus)*. They take a little forked birch twig, about a span long, which is stuck into the snow perpendicularly by its divided end, forming a sort of arch. A snare or noose made of pack-thread or horse-hair, is then fixed to the twig by one end, and placed in the open space between the forks. The thin curling bark of the twig being carefully slit down at the outer side, curls inwards and serves both to confine and conceal the snare, by drawing it close to the branch on the inner side. Such traps as these are ranged in a line, about a fathom from each other in the birch thickets, brush wood being laid from one to another so as to form a low fence. Now as the ptarmagans come running along, for they seldom fly, they have no way to go but through these snares, and forty or fifty of them are frequently caught at a time.

Such is the best account which I have been able to collect of the manners and customs of the Laplanders. I have almost implicitly followed the account of these particulars given by Linnæus; both because I considered him as a very accurate observer, and as a man of unimpeached veracity. But I have compared his accounts with those of the Danish missionary Leems, and find a striking agreement between them. The English reader may have an opportunity of making the comparison by turning to the second volume of Acerbi's travels in Sweden and Lapland, where there is a kind of translation of Leems, considerably injured by the introduction of much irrevelant matter, and by the foisting in of scraps of sciences, with which the author of these travels was undoubtedly unacquainted. I am tempted to conclude this chapter with a quotation from Linnæus's Tour in Lapland, as it will convey a better idea of the nature of the country to an English reader than any

general description whatever. He was travelling in Lycksele Lapland between 64° and 65° of north latitude. The season was the second and third of June, and he was endeavouring to penetrate into the interior of the country by sailing up the river Umæa.

"At length we came to a sort of bay or creek of the river, which we were under the necessity of wading through. The water reached above our waist, and was very cold. In the midst of this creek was so deep a hole that the longest pole could scarcely fathom it. We had no resource but to lay a pole across it, on which we passed over at the hazard of our lives; and indeed when I reached the other side, I congratulated myself on having had a very narrow escape. A neighbouring mountain affords grey slate; but of a loose and brittle kind.

"We had next to pass a marshy track, almost entirely under water, for the course of a mile, nor is it easy to conceive the difficulties of the undertaking. At every step we were knee-deep in water; and if we thought to find a sure footing on some grassy tuft, it proved treacherous and only sunk us lower. Sometimes we came where no bottom was to be felt, and were obliged to measure back our weary steps. Our half-boots were filled with the coldest water, as the frost in some places still remained in the ground. Had our sufferings been inflicted as a capital punishment, they would, even in that case, have been cruel. What then had we to complain of? I wished I had never undertaken my journey, for all the elements seemed adverse. It rained and blowed hard upon us. I wondered that I escaped with life, though certainly not without excessive fatigue and loss of strength.

"After having thus for a long time gone in pursuit of my new Lapland guide, we reposed ourselves about six o'clock in the morning, wrung the water out of our clothes, and dried our weary limbs, while the cold north wind parched us as much on one side as the fire scorched us on the other, and the gnats kept inflicting their stings. I had now my fill of travelling.

"The whole landed property of the Laplander, who owns this track, consists chiefly of marshes, here called *styga*. A divine could

never describe a place of future punishment more horrible than this country, nor could the Styx of the poets exceed it. I may therefore boast of having visited the Stygian territories.

"We now directed our steps towards the desert of Lapmark, not knowing where we went.

"A man who lived nearest to the forlorn spot just described, but who had not been at it for twenty years past, went in search of some one to conduct me farther, while I rested awhile near a fire. I wished for nothing so much as to be able to go back by water to the place from whence I came; but I dreaded returning to the boat the way we had already passed, knowing my corporeal frame to be not altogether of iron or steel. I would gladly have gone eight or ten miles (sixty or seventy English) by a dry road to the boat, but no such road was here to be found. The hardy Laplanders themselves, born to labour as the birds to fly, could not help complaining, and declared they had never been reduced to such extremity before. I could not help pitying them.

"A marsh called *Lyckmyran* (lucky marsh), but which might more properly be called *Olyckmyran* (unlucky marsh), gives rise to a small rivulet, which takes its course to Lycksele, and abounds in ochre. The water is covered with a film. I am persuaded that iron might be found there.

"We waited till about two o'clock in the afternoon for the Laplander I had sent on the expedition above mentioned, who at length returned quite spent with fatigue. He had made the requisite inquiries at many of the huts, but in vain. He was accompanied by a person whose appearance was such that at first I did not know whether I beheld a man or a woman. I scarcely believe that any practical description of a fury could come up to the idea which this Lapland fair one excited. It might well be imagined that she was truly of Stygian origin. Her stature was very diminutive; her face of the darkest brown, from the effects of smoke; her eyes dark and sparkling; her eye-brows black; her pitchy coloured hair hung loose about her head, and on it she wore a flat red cap; she had a grey petticoat; and from her neck, which resembled the skin of a frog, were suspended a

a pair of large loose breasts of the same brown complexion, but encompassed, by way of ornament, with brass rings; round her waist she wore a girdle, and on her feet a pair of half-boots.

"Her first aspect really struck me with dread; but though a fury in appearance, she addressed me with mingled pity and reserve in the following terms: 'O thou poor man! what hard destiny can have brought thee hither, to a place never visited by any one before? This is the first time I ever beheld a stranger. Thou miserable creature! how didst thou come, and whither wilt thou go? Dost thou not perceive what houses and habitations we have, and with how much difficulty we go to church?'

"I entreated her to point out some way by which I might continue my journey in any direction, so as not to be forced to return the way I came. 'Nay, man,' said she, 'thou hast only to go the same way back again; for the river overflows so much, it is not possible for thee to proceed farther in this direction. From us thou hast no assistance to expect in the prosecution of thy journey, as my husband, who might have helped thee, is ill. Thou mayest inquire for our next neighbour, who lives about a mile off, and perhaps if thou shouldest meet with him, he may give thee some assistance; but I really believe it will scarcely be in his power.'

"I inquired how far it was to Sorsele. 'That we do not know,' replied she; 'but in the present state of the roads it is at least seven days' journey from hence, as my husband has told me.'

"My strength and health being by this time materially impaired by wading through such an extent of marshes, laden with my apparel and luggage, for the Laplander had enough to do to carry the boat; by walking for whole nights together; by not having for a long time tasted any boiled meat; by drinking a great quantity of water, as nothing else was to be had; and by eating nothing but fish, unsalted and crawling with vermin: I must have perished but for a piece of dried and salted rein-deer's flesh, given me by my kind hostess, the clergyman's wife at Lycksele. This food, however, without bread, proved unwholesome and indigestible. How I longed once more to meet with

people that fed on spoon meat! I inquired of this woman whether she could give me any thing to eat. She replied, 'Nothing but fish.' I looked at the fresh fish, as it was called, but perceiving its mouth to be full of maggots, I had no appetite to touch it; but though it thus abated my hunger, it did not recruit my strength. I asked if I could have any rein-deer tongues, which are commonly dried for sale, and served up even at the tables of the great; but was answered in the negative. 'Have you no cheese made of rein-deer's milk?' said I. 'Yes,' replied she, 'but it is a mile off.' 'If it were here, would you allow me to buy some?' 'I have no desire,' answered the good woman, 'that thou shouldest die in my country for want of food.' On arriving at her hut I perceived three cheeses lying under a shed without the walls, and took the smallest of them, which she, after some consultation, allowed me to purchase.

"I was at last obliged to return the way I came, though very unwillingly, heartily wishing it might never be my fate to see this place again. It was as bad as a visit to Acheron. If I could have run up the bed of the river like a Laplander, I might have gone on, but that was impossible."

# CHAPTER XX.

## OF THE NORTHERN PROVINCES OF SWEDEN.

Norrland—Jämtland—Dahlsland—Structure—Mines and Minerals—Vermeland—Structure—Philipstad—Mines in its Neighbourhood—Minerals found in them—Other Mines in the Province.

THERE still remains a very great division of Sweden, that portion which is distinguished by the name of Norrland. In the most extensive acceptation of the word, Norrland includes in itself Swedish Lapland, and extends from north latitude 68° to 62°, comprehending a space of above 400 miles in length, and extending over the whole breadth of Sweden. It is divided into four provinces, namely, North Bothnia, West Bothnia, West Norrland, and Jemtland. The whole of the first two of these provinces, except the sea coast, belongs to Lapland, and is inhabited by Laplanders. The population of both does not exceed 68,000. Yet in point of bulk they are not much inferior to all Svealand (Sweden) and Gothland together. Indeed Norrland, in extent of surface, is nearly twice as large as all the rest of his Swedish Majesty's dominions. Western Norrland is the smallest of the four provinces into which Norrland is divided; but at the same time by far the most populous; the number of its inhabitants amounting to 59,684. This is owing to the extent of sea coast which belongs to this province, to the considerable rivers which run through it, and to the fertility of the soil.

Jämtland is an inland province of considerable size, immediately on the north side of Dalecarlia. From Hermelin's map it appears to be altogether primitive, and to be composed of gneiss or granite, except a track in the neighbourhood of the *Starj Storsjon*, a great lake in the middle of the province, which track belongs to the floetz class of rocks. It resembles exactly in its structure the numerous floetz tracks in West Gothland, Nerike, &c. which have been described in a preceding part of this work. The lowest rock known consists of a bed of sandstone, over this lies a bed of alum slate, containing as usual stinkstone; over this is a thick bed of floetz limestone which constitutes the uppermost rock of all. A representation of this track has been given in plate XIII. figure 12. It is curious, because it shows us how widely extended this peculiar floetz track of rocks is in Sweden.

The western side of Jämtland is exceedingly mountainous. The highest mountains in Scandinavia are to be found in it. The mountain of Syltoppen, which lies in this province, is no less than 6652 feet high.

There are two provinces in that division of Sweden called *Svealand* which I did not visit; namely, Dahlsland and Vermeland; but of which I am able to give some account, as they have been visited by men of science, and described in different Swedish books, which I have had an opportunity of seeing. Dahlsland is a small province bounded on the north by Vermeland, on the east by the lake Vener, on the south by Bohuslän, a province originally belonging to Norway, but conquered by the Swedes, and on the west by Norway. It constitutes, as it were, the termination of that range of mountains which run between Sweden and Norway, and which gradually diminish in size and height as they advance to the south, till at last in Dahlsland they are nothing else than knolls and ridges.

The whole of this province is primitive, if we except the alluvial soil upon the banks of the Vener. The principal rock is gneiss, and as far as I can learn, it is quite similar to the gneiss of West Gothland, and the neighbourhood of Gottenburg. Beds of mica slate occur at Orbols, containing beds of grey and reddish quartz, which, according

to Hisinger, dip east at an angle of 45 degrees. There are some mines in this province; I shall mention the principal. The mine of *Rolfsby* in the parish of Tössö contains sparry iron ore. It was abandoned in 1778 in consequence of a failure of the ore. Sulphate of barytes is found in this mine, which deserves to be noticed on account of the scarcity of that mineral in Sweden. It is very impure. The following are the results of the analysis of two varieties of it by Professor Afzelius. The first variety is without any regular crystalline shape, is semi-transparent, and its specific gravity is 4·518. Its constituents are

| | |
|---|---|
| Sulphate of barytes ..... | 63 |
| Sulphate of lime ..... | 2 |
| Silica ..... | 19 |
| Alumina and iron ..... | 9 |
| Water ..... | 2 |
| | 95 |
| Loss ..... | 5 |
| | 100 |

The other variety is mixed with iron ore and fluor spar, and is of a blackish colour. Its specific gravity is 4·399. Its constituents were found to be

| | |
|---|---|
| Sulphate of barytes ..... | 59 |
| Sulphate of lime..... | 7 |
| Silica ..... | 20 |
| Alumina and iron ..... | 11 |
| Water..... | 3 |
| | 100 |

The mine of Nötö, in the parish of Tidje. It contains sparry iron ore, and likewise fahlore. I do not know whether it be wrought either as an iron or copper mine.

The mines of Förhoppning and Knolle, in the parish of Ominskog. They are situated in a quartz rock, which appears to constitute a bed in mica slate, the rock of which the parish is chiefly composed. These

are copper mines, and contain the following minerals: calcareous spar; brown spar; fluor spar, both massive and crystallized; variegated copper ore; fahlore, with silver, copper pyrites, and antimony; according to Cronstedt it yields 24 per cent. of copper, and 26 lod of silver; native silver in quartz; a combustible substance like coal, containing silver and copper, and smelling of sulphur in the fire.

Hvassvik mine, in the same parish, contains both copper and lead. The minerals found in it are calcareous spar, steel-grained galena, containing forty lod of silver in the hundred weight; native silver in quartz; copper pyrites crystallized in tetrahedrons.

Vingnäs mine, in the same parish, yields sparry iron ore. It contains, likewise, fahlore, copper pyrites, and variegated copper ore. An impure sulphate of barytes is found in it; which, according to the analysis of Professor Afzelius, is composed of the following constituents:

| | |
|---|---|
| Sulphate of barytes..... | 71 |
| Sulphate of lime..... | 11 |
| Silica..... | 13·5 |
| Alumina and iron..... | 0·5 |
| Water..... | 4 |
| | 100 |

The specific gravity of this mineral is 4·391. Its colours are reddish and white. It occurs granular and sparriform.

Äskärr mine, in the same parish, yields galena and copper pyrites.

In the same parish there is a lime quarry. The lime is primitive, white, with rose-red streaks and bands in it.

Klapperud iron mine is situated in the hill called Klof, in the parish of Fröskög. The ore found in this mine is poor, and mixed with manganese. The cast iron obtained from it contains manganese, and is easily converted into excellent cast steel; but does not yield good iron. There is a kind of ore of manganese in this mine, which was analysed by Klaproth. It is black, massive, and has considerable lustre. Its constituents are as follows:

| | |
|---|---|
| Oxide of manganese | 60 |
| Silica | 25 |
| Volatile matter | 13 |
| Loss | 2 |
| | 100* |

Some other varieties of manganese occur in the same mine. It contains also specimens of malachite.

In the hill of Hafsos, in the parish of Hessleskog, specimens of native silver are found in the rock; which, as far as I could learn, consists of mica slate. In the same hill occur specimens of molybdena, of variegated grey copper ore, and of sulphate of barytes; which, according to the analysis of Professor Afzelius, is composed of the following constituents:

| | |
|---|---|
| Sulphate of barytes | 80 |
| Sulphate of lime | 3 |
| Carbonate of lime | 8 |
| Silica | 2 |
| Alumina and iron | 3 |
| Water | 2·5 |
| Loss | 1·5 |
| | 100 |

Björby mine, in the same parish, contains galena, copper pyrites, and variegated copper ore.

Slädkärr mine, in the same parish, yields fahlore; which, besides sulphur, contains 0·26 copper, 0·30 antimony, and yields 22 lod of silver per hundred weight. Native silver is found in the same mine, in quartz.

These are the principal mines in Dahlsland; and, as far as I could learn, none of them are of any great importance, or wrought to any considerable extent.

* Klaproth's Beitrage, iv. 139.

Vermeland, the last province which we have to notice, is of much greater importance. It lies upon the north side of the lake Vener, and extends as far north as latitude 61°, gradually narrowing to a point. On the north it is bounded by Norway, on the east by Dalecarlia and Nerike, on the south by the lake Vener and Dahlsland, and on the west by Norway. The chain of mountains which separate Sweden from Norway runs along its west side; but by the time they have got so far south, they have lost their great height, and diminish more and more, as they advance to the south, till they become quite insignificant. The greatest length of this province, from north to south, is about 110 miles; and its greatest breadth, from east to west, about 80; but towards the northern extremity it becomes very narrow, its breadth gradually diminishing to a few miles. Its lying in the neighbourhood of the lake Vener is of considerable advantage to this province, by furnishing an easy communication with Gotteburg and the sea. The trade carried on over the lake, and along the river Gotha, is very considerable; and now that the whole of that river is navigable, from the lake Vener to the sea, the trade ought to increase, and the provinces near the lake to increase in wealth and in population. There are various manufactures placed around the lake, entirely in consequence of the abundance of wood, and the easy communication which the lake furnishes with the sea.

The river Clara runs through this province, and falls into the lake Vener. It is a large river; but, like the Dal, runs so slowly, that it has more the appearance of a lake than a river. Some miles before it falls into the Vener, it divides into two branches, enclosing the island of Tingwalla. At the northern extremity of this island stands the town of Carlstad; so called because it was built by Charles IX. This town is a bishop's see. Like the other Swedish towns, it is built of wood. The streets are broad and straight, and the number of inhabitants about 1500. It carries on a commerce of wood and iron across the lake Vener. The only other town in the province is Philipstad, built also by Charles IX. and named after his son Philip. It stands in a hilly country, between two small lakes, on a lively rivulet. It is a

very small place, and has been repeatedly burnt down. It depends entirely upon the numerous iron mines in its neighbourhood.

The whole of Vermeland, with the exception of a small track on the borders of the Vener, is primitive, and may be said to consist entirely of gneiss rocks, similar to those which constitute the neighbourhood of Gotteburg. Here and there there occur beds of mica slate, limestone, primitive greenstone, &c.; but none of them, as far as I could learn, are of any great extent. It is to the mines which abound in this province that it owes its chief value. It will be necessary, therefore, to take a view of these mines, and to mention the principal minerals that occur in them, as far as they have come to my knowledge. I shall begin with those in the parish of Philipstad, because they are the most important.

Pehrsberg is a hill which, from the description I have got of it, appears to be composed of a gneiss rock containing hornblende, and therefore analagous to sienite. On its south-west side there occurs a bed of primitive limestone. This hill contains a great many veins of iron ore; the vein-stones accompanying which, as far as I could learn, are garnet, calcareous spar, and hornblende. I cannot undertake to describe each particular vein, as I had no opportunity of examining them, and do not know that any accurate account of them has been published. The names of the principal veins are, *Stor grufva, Badstuge grufva, Streta, Kammar grufva, Bricke grufva, Kofve.* The following is a catalogue of all the minerals that have been found in these mines, as far as my information goes.

Pyramidal crystals of calcareous spar *(Ch. metastique* of Haüy). *Kammar grufva.*

Globular fibrous limestone. *Kammar grufva.*

Grey and greenish chlorite slate.

Green, semi-transparent serpentine, with layers of asbestus. *Sandels grufva.*

Light green asbestus. *Sandels grufva.*

Dark green, large foliated mica. *Stor grufva.*

Reddish brown garnet. *Stor grufva,* &c.

Reddish flesh-coloured hornstone. *Stor grufva.*

Iron pyrites in druses and octahedral crystals.

Octahedral crystals of iron ore in chlorite. *Sandels grufva, Krangrufva.*

White and reddish thin slaty calcareous spar.

Green sparry hornblende.

White and smoke-grey quartz crystals.

Crystallized acanticone *(pistazite).*

Sulphuret of bismuth.

The mine of Torskebäck was wrought to a considerable extent during the sixteenth, seventeenth, and eighteenth centuries, and yielded copper and silver in considerable quantity. The ores consist of galena, and copper pyrites with blende, which almost universally accompanies galena.

The mine of Nyhyttan was begun to be wrought in the year 1730. It contains the same ores with the preceding; namely, copper pyrites, galena, and blende.

The mine of Nordmark lies about ten miles west from Philipstad. The mineral which it yields is iron ore. It seems to lie in a rock of mica slate. Limestone, containing manganese and hornblende, likewise occurs in it. The minerals which it contains are as follows:

Granular limestone, containing iron and manganese.

Calcareous spar, crystallized in six-sided prisms, terminated by three-sided pyramids (*Ch. dodecaëdre* of Haüy), and likewise in pyramids (*Ch. metastique* of Haüy).

Mountain cork.

Black, large leaved mica.

Dark green fibrous hornblende.

Dark crystallized malacolite *(salite).*

Red-coloured garnets.

Dark blue clay, in which were found, in the year 1730, native silver, oxide of nickel, and iron ore.

There is a peculiar mineral found in this mine, to which no name has hitherto been given. It was examined by Assessor Gahn, of

Fahlun, and found to contain muriatic acid. Its colour is yellowish brown passing into greenish; by transmitted light it appears greenish yellow. Usually crystallized in regular six-sided prisms. Lustre glistening. Cross fracture uneven; surface splendent. Opaque. Semihard; scratched by the knife. The crystals are usually several inches in length. Specific gravity 3·081. Before the blow-pipe it becomes reddish-brown, and emits the odour of muriatic acid. By continuing the heat it melts into a black slag, which is attracted by the magnet. It dissolves before the blow-pipe in borax, and shows by the colour that it contains iron and manganese. Its constituents are silica, lime, iron, manganese, and muriatic acid. From the preceding description this mineral would appear to constitute a species apart; but never having seen any specimen of it, we cannot venture to determine the point with any certainty.

Petroleum in the iron ore.

Galena with blende. It contains very little silver; only three lod in the hundred weight.

The iron ore consists chiefly of magnetic ironstone. Octahedral crystals of iron ore likewise frequently occur.

The hill of Taberg likewise contains an iron mine of some importance. This hill, it would appear, consists of mica slate, and the mine, I am informed, constitutes a vein. The vein-stones are mica, limestone, and asbestus. The ore is magnetic ironstone. The principal minerals contained in this mine are the following:

Calcareous spar.

White and light green fluor spar.

Light grey and greenish bitter spar. According to the analysis of Klaproth, it is composed of the following constituents:

| | |
|---|---|
| Carbonate of lime..... | 73 |
| Carbonate of magnesia..... | 25 |
| Oxide of iron, containing manganese.. | 2·25 |
| | 100·25 |

Light blue bitter spar, mixed with asbestus.

Black, large leaved mica.

Dark green chlorite.

Light green asbestous actinolite.

Light green glassy tremolite, found in the lime-stone

Light grey asbestus, in long fibres.

A greenish grey steatite, composed, according to the analysis of Geijer, of the following constituents:

| | |
|---|---|
| Magnesia | 31 |
| Silica | 48 |
| Iron | 5 |
| Volatile matter | 16 |
| | 100 |

Massive and cubic pyrites.

The mines of *Age* are situated about seven miles from Philipstad. Like the preceding, they consist of iron ore, which occurs in a rock of mica slate. The following minerals occur in these mines:

White, greenish, and reddish-brown calcareous spar.

A kind of grey indurated clay, containing regular dodecahedral crystals of garnet.

Black, large leaved mica.

Black foliated hornblende.

Acanticone *(pistazite)* crystallized in quartz.

A yellowish green massive mineral, which is considered as acanticone.

Mountain cork, and asbestus in long fibres.

Grey, green, and red hornstone.

Quartz crystals.

Magnetic ironstone.

The iron mines of Hökeberg and Krokos, which lie not far from Philipstad, contain nothing particular.

The iron mine of Longbanshytle has been wrought these three hundred years. It lies about ten miles from *Pehrs* hill, and is not far

from the lake Longban. It seems, as far as I coul ırn, to be situated in a limestone rock. The minerals which it contains are the following:

White glittering limestone, containing iron and manganese.
Whitish grey limestone, mixed with yellow and green serpentine.
Globular fibrous limestone.
White fibrous gypsum, in thin layers.
White brown spar, in round balls.
Serpentine.
Mountain cork, and mountain leather.
White clay.
Black massive hornblende.
Dark red, and reddish brown, iron flint.
Crystallized acanticone *(pistazite)*.

Greenish malacolite *(sahlite)*. It has an obscure foliated fracture. Cross fracture small, splintery. Translucent on the edges. Scratches glass. Specific gravity 3·29. Before the blow-pipe froths and melts to a grey bead. With borax it melts into a colourless glass. It contains more than half its weight of silica. The remaining constituents are lime, magnesia, and some manganese and iron. Such are the description and constituents of this mineral, as drawn up by Hisinger. I have not myself had an opportunity of seeing any specimens of sahlite from this mine, and therefore do not know how far it differs from the specimens of the same mineral that occur in the lead mine of Sala.

Dark red garnets with channelled sides, which yield 15 per cent. of iron. Likewise garnets of a wax yellow colour, which yield 21 per cent. of iron.

A mineral considered as garnet, containing manganese. Its colour is reddish brown, and in thin plates it is brownish yellow. It occurs massive. Both internally and externally its lustre is shining, passing into splendent. Fracture uneven, fine granular, passing into splintery. Fragments indeterminate, sharp edged. Translucent on the edges.

Hard; scratches glass, but not quartz. Strikes fire with steel. Specific gravity 4·136. Melts before the blow-pipe into a black opaque bead. Its constituents, according to the analysis of Link, are as follows:

| | |
|---|---|
| Silica | 33 |
| Carbonate of lime | 34 |
| Oxide of iron | 17 |
| Oxide of manganese containing iron | 10 |
| Volatile matter | 4 |
| Loss | 2 |
| | 100 |

Petroleum.

Glance coal.

Red ore of manganese. Its colour is rose red. Fracture foliated, with three cleavages constituting a rhomboid. Lustre splendent. Translucent on the edges. Gives fire with steel, and scratches glass. Specific gravity 3·5384. Before the blow-pipe its colour at first becomes darker, and at last melts into a reddish brown bead. With borax it at first effervesces, and at last fuses. Its constituents, according to the analysis of Berzelius, are as follows:

| | |
|---|---|
| Black oxide of manganese | 52·60 |
| Silica | 39·60 |
| Oxide of iron | 4·60 |
| Lime | 1·50 |
| Volatile matter | 2.75 |
| | 101·05 |

Crystallized pyrites (the *cubo dodecahedre* of Haüy).

Micaceous iron ore.

Specular iron ore mixed with magnetic ironstone.

Specular iron ore in flat many-sided crystals, similar in form to those in the iron ore from Elba. It is attracted by the magnet.

There are many other mines in the neighbourhood of Philipstad. The following are the principal of these:

Lindbom, containing magnetic ironstone and malachite.

Malmön, an iron mine.

Kernsberg, an iron ore mixed with garnets.

Geteberg, called a silver mine, but consisting, in fact, of galena mixed with blende and iron ore.

Stjernberg was wrought in the 16th century as a copper mine. The ore is copper pyrites.

Remsberg, an iron mine.

Osarne, likewise called a silver mine, but consisting of galena, which yields 60 per cent. of lead, and $3\frac{1}{3}$ lod of silver per hundred weight of ore. It began to be wrought in 1781.

Torrakeberg consists of a mixture of serpentine and granular limestone, and contains a vein of magnetic ironstone. The vein-stones are hornstone, limestone, and serpentine. Garnets, and arsenical pyrites, occur likewise in this mine.

Fagerberg contains an iron mine. There occurs in it a garnet rock, which separates into quadrangular fragments, is attracted by the magnet, and contains 18 or 19 per cent. of iron.

Thyn. In this mine there occurs a dark red mineral, called on the spot *rödberg*, composed of waving plates, much twisted and marbled. It contains 14 per cent. of iron.

Such are the various mines in the neighbourhood of Philipstad. They constitute the most important, and, indeed, almost the only ones in the province of Vermeland. There are, however, a few others which it may be worth while to mention.

Hornkullen, in the parish of Kroppa, is a silver mine which was wrought to a considerable extent during the reign of Charles IX. It consists of galena mixed with blende, and contains iron pyrites.

There are three or four iron mines in the same parish; but which do not seem entitled to a particular description. The ore in all of them, as far as I could learn, is magnetic ironstone.

In the parish of Carlskoga there occur four iron mines, called *Mangshöjden Kjerne*, *Dufvedals*, and *Utterbäck*. I do not know what species of iron ore they contain, but probably it is magnetic ironstone.

In the same parish there is a mine, formerly wrought for the silver which it contained. The ore is galena, mixed with blende of a yellowish green colour, and possessing the property of phosphorescing. Not far from this mine there is a kind of jasper which occurs.

Iron sand is found upon the borders of the lake Margen, in considerable quantity.

Graphite is found at Gumhöjden, in the parish of Roda.

The mine of *Östra Mangs* is remarkable for yielding native copper, which is an uncommon mineral in Sweden. It contains likewise malachite and copper pyrites. Various species of iron ore occur in the same mine; as magnetic ironstone, specular iron ore, &c. This mine occurs in the parish of Gräsmark. There are two or three other mines in the same parish.

There are likewise several iron and copper mines in the parish of Gunnarskog. I am not sure, indeed, whether or not they are wrought; but the ores at least occur. They consist of magnetic iron-stone, and variegated copper ore; and the rock in which they all occur appears to be quartz.

The mine of *Rud* in the parish of Glafva, yields both silver and copper. The ores which occur in it are fahlore, variegated copper ore, copper pyrites, and galena containing seven lod of silver in the hundred weight. White-coloured compact sulphate of barytes is found in the same mine. The rock appears to be quartz.

Holmserud, in the parish of Skillingmark, contains magnetic ironstone yielding 60 per cent. of iron.

Tvärdal, in the parish of Silbodal, contains copper pyrites and galena. The rock, or vein-stone rather, is white quartz.

Torgelsbyn, in the parish of Sillerud, was wrought in the year 1782. It contained galena, yielding only 17 per cent. of lead, and $2\frac{1}{2}$ lod of silver, per hundred weight of ore.

At Malsjö, in the parish of Grum, there is a limestone quarry. The limestone is primitive, of a white or light blue colour. It contains specimens of scapolite.

Such is the best account I have been able to collect of the minerals which occur in the province of Vermeland. Before finishing this chapter, I think it worth while to notice again the mineral which occurs in the iron mine of Lonbanshytta, which I mentioned as garnet containing manganese. The description which I gave of it was taken from Link, who published an account of it in Gehlen's Journal. But Emanuel Rothoff has lately published a more elaborate description and analysis of it, in the third volume of Hisinger and Berzelius's *Afhandlingar i Fysic, Kemi, och Mineralogi*, page 324. His description of its properties is pretty similar to what has been already given; except with regard to the specific gravity, which he found less than Link had done. The specific gravity of three specimens examined by him was as follows, 3·84, 3·83, and 3·69. The constituents, according to the analysis of Rothoff, were as follows:

| | |
|---|---|
| Silica | 35·20 |
| Lime | 24·70 |
| Alumina | 0·20 |
| Oxide of iron | 26·00 |
| Oxide of manganese | 8·60 |
| Soda | 1·05 |
| Carbonic acid | 2·00 |
| Loss | 2·25 |
| | 100·00 |

This differs somewhat from the result obtained by Link, as stated above. It approaches the constituents of a garnet-shaped mineral, from the mountains of Thuringwold, analysed by Bucholz, who obtained the following constituents and proportions:

| | |
|---|---|
| Silica | 34·50 |
| Lime | 30·75 |
| Alumina | 2·00 |
| Oxide of iron | 25·00 |
| Oxide of manganese | 3·50 |
| Carbonic acid and water | 4·25 |
| | 100·00* |

We may perhaps consider the two minerals as belonging to the same species.

Gahlen's Journal, iv. 172.

# CHAPTER XXI.

## GENERAL VIEW OF SWEDEN

Size and Boundaries—Account of the surrounding Seas—Their specific Gravity and Constituents—Size of the Provinces—Lakes—Rivers—Mountains—Surface of the Country—Geognosy—Formations in Sweden—Metals found in it—Table of the Iron Mines and Works—Climate compared with that of Russia—Winter—Summer—Vegetables—Trees—Fruits—Corn—Domestic Quadrupeds—Wild Quadrupeds—Birds—Fishes.

I HAVE now finished the observations which I was able to make during my short journey through Sweden. But I presume it will be acceptable to the reader to see a more connected view of the most important topics than was consistent with the details of a journey, in which I was obliged to carry the reader from province to province, and of course to be guided, in a great measure, by continuity of time and place, rather than by the close connections between the topics touched upon. I shall therefore add two chapters. In the first of which I shall consider Sweden in a scientific point of view, as far as regards her natural productions and her situation: in the second I shall consider her in a political point of view, as far as regards her population, her resources, her trade and manufactures, her connexion with other nations, and the part which it would be most for her interest to act in the political theatre of Europe.

Sweden, if we include Norway, is very nearly an island, for it is surrounded on all sides by the sea, except the north east corner where there is an interval between the Gulf of Bothnia and the northern ocean, extending from latitude 66° to about 70°, or about 280 miles. The sea coast of Sweden and Norway must considerably exceed 2000 miles in extent. These seas take various names according to their situation. The sea which washes the coast of Norway is a part of the Atlantic, and does not differ from that ocean in its constituents. The same remark applies to the Northern Ocean, which washes the northern coast of Scandinavia. But the case is very different with all the inland seas which wash the south coast of Norway, and the south and east coast of Sweden. These seas take different names in different places. The entrance into the inland sea, or the sea between the north coast of Jutland, and the south coast of Norway, is called the Sleeve, or the Scaggerak. It extends rather more than 150 miles in length, from the Naze of Norway to the coast of Sweden; and its average breadth is about 70 miles; so that you may sail through it without seeing land on either side. The coast of Norway indeed is high; but Jutland is so low that you do not perceive it till you are very near it. We came within a very few miles of that coast before we perceived it at all, and some of the vessels were very nearly ashore owing to the same ignorance.

From the Scaw, which is the farthest north and east part of Jutland to the Sound, the sea takes the name of Kattegat. It is in length about 120 miles, and its average breath is about 70. It is narrowest at the north end, and becomes wider as we advance to the south. At the sound a great number of islands occur, which almost fill up the interval between Sweden and Germany. The principal of these are Zealand and Funen, between which and the neighbouring continent there are three principal straits, namely, the Sound, the Great Belt, and the Little Belt. The Sound separates Sweden and Zealand, and is about three miles in breadth. The Great Belt, which separates Zealand from Funen is much wider. The Sound used formerly to be the way by which all vessels passed from the Cattegat into the Baltic, and

they all paid a toll to the King of Denmark, as a compensation for the light-houses which he kept up on his coasts. But since the war between Great Britain and Denmark, these light-houses have been removed, and the vessels now pass from the Cattegat into the Baltic, through the Great Belt. Not that the Danes are able to prevent the passage of the Sound, as was demonstrated by the passing of the British fleet in 1801; but the Great Belt, in consequence of its greater breadth, has been found safer for merchant vessels sailing under convoy.

From the Danish islands to the latitude of Stockholm, the sea is known by the name of the Baltic. It goes first in an easterly direction as far as Memel, a length of about 300 miles, with a mean breadth, amounting to about 140 miles. It then proceeds in a northerly direction from the north coast of Germany to the islands of Oland, a length of about 350 miles, with a mean breadth of about 170 miles. At this place it separates into two gulfs, the Gulf of Finland, which runs directly east to Russia, and terminates at St. Petersburgh, constituting a length of about 200 miles, with a mean breadth of about 70 miles. The Gulf of Bothnia runs north, nearly to the latitude of 66°, constituting a length of nearly 350 miles, with a mean breadth of about 100 miles. It is narrowest at Umea, where its breadth does not much exceed 40 miles.

The constituents of the Baltic differ materially, at least in point of quantity, from those of the Ocean. It is well known that the Ocean consists of water, holding in solution a certain proportion of the following salts:

Common salt.
Muriate of magnesia.
Sulphate of magnesia.
Sulphate of lime.
Sulphate of soda?

The average quantity of all these salts held in solution by the waters of the Ocean, amounts to about one twenty-seventh of the weight of

the water. That is to say, every twenty-seven grains of sea-water contain one grain of these salts in solution. But this is very far from being the case with the water of the Baltic. I took the specific gravity of the sea water of the Frith of Forth, of water taken up at Tunaberg on the coast of Södermanland, somewhat to the south of Stockholm, of water taken up at the Sound, and of water taken up off the Scaw point. The following were the results obtained. The specific gravities were taken at the temperature of 60°.

| | Specific gravity. |
|---|---|
| Water from the Frith of Forth ..... | 1·02900 |
| Water from the Baltic off Tunaberg..... | 1·00476 |
| Water from the Sound ..... | 1·00701 |
| Water off the Scaw point ..... | 1·02037. |

We see from the above table that the specific gravity is least at Tunaberg, and that it gradually increases as we proceed towards the Ocean. But even off the Scaw the specific gravity is greatly inferior to that of the water in the Frith of Forth, which I conceive to be the same with that of the German Sea and of the Atlantic Ocean in general. There is one circumstance, however, which I ought to mention. The water at Tunaberg, and at the Sound, was taken from the margin of the sea; for I had no means of going out to any distance from the shore. But as the places I pitched upon were far from the issue of any rivers, I conceive that this could not make any sensible difference. Besides, in both places, I had it in my power to go to the extremity of a pretty long pier, so that the water in both cases was in fact taken up at least 100 yards from the shore. The only other experiments made on the specific gravity of the Baltic, which I have had an opportunity of seeing are those of Wilke, and as he does not tell us from what part of that sea his water was taken, they do not lead to any satisfactory conclusions. But it is probable, as he lived in Stockholm, that the part of the Baltic from which he drew his water would be as far north as that capital. He found that the specific gravity was much

influenced by the direction of the wind. The following are the results which he obtained:

| | |
|---|---|
| Wind at east | 1·0039 |
| Wind at west | 1·0067 |
| Storm at west | 1·0118 |
| Wind at north-west | 1·0098 |

From the great effect of the wind one would be tempted to suspect that the place of the Baltic from which he took the water that he examined was pretty far to the south; but that does not agree with the first specific gravity which he found, and which is lower than that of the water taken up by me at Tunaberg. It is proper to state that I took up the water which I examined in calm weather, and there had been no violent winds for at least a month. So that I consider the results which I obtained, as yielding a pretty fair mean of the contents of the Baltic at the different places examined.

One thousand grains of each of these waters were evaporated to dryness at a temperature which never exceeded 180°, and the dry residue was kept for eight hours in the temperature of about 200°, by means of a steam-bath, and then weighed. The weights of the salt furnished by each specimen are as under:

| | Weight of salt. |
|---|---|
| Water of the Frith of Forth | 36·6 |
| Water from Tunaberg | 7·4 |
| Water from the Sound | 11·2 |
| Water from the Scaw | 32·0 |

From this table we see that the Baltic at Tunaberg scarcely contains one-fifth part of the saline contents of the ocean which surrounds Great Britain. The water at the Sound contains rather less than one-third, and the difference between the water of the ocean and that at the Scaw, though less, is still very considerable. If we reckon the salt contained in the Baltic, at Tunaberg, 1, the following table exhibits

the relative proportion of salt contained in the water taken up at other places:

| | |
|---|---|
| Water from Tunaberg | 1·000 |
| Water from the Sound | 1·513 |
| Water from the Scaw | 4·324 |
| Water from the Frith of Forth | 4·945 |

The water at Tunaberg tastes slightly brackish, but is so little so that it may be drunk without much inconvenience. And I have been told by the sailors that they commonly use the water of the Baltic for their food. The water at the Sound is perceptibly salter, but still not disagreeably so. But the water off the Scaw tastes as salt as the water of the Ocean itself.

I analysed a quantity of the salt obtained from the water taken up off the Scaw, by methods well known to chemists, and which it is unnecessary to detail here. The following was the result which I obtained. It may be considered as exhibiting the constituents of sea water in general, for I presume it will hardly be doubted that the proportions are every where nearly the same:

| | |
|---|---|
| Common salt | 55·7 |
| Sulphate of magnesia | 25·0 |
| Muriate of magnesia | 19·3 |
| | 100·0 |

I have reason to believe that there exists likewise in sea-water a portion of sulphate of soda. I have not indeed been able to separate any such salt; but I find always a surplus of sulphuric acid which must be united to some alkaline body. Sulphate of lime is likewise present, but in so small a quantity, that in a general view of this kind it may be omitted altogether.

Thus the Baltic sea differs entirely in its constitution from the water of the Ocean, containing much less salt, and diminishing in saltness as we advance northward. If the same rate of diminution which I ob-

served between the Sound and the Baltic, at Tunaberg, continue to the northern extremity of the Gulf of Bothnia, the water at that part ought to be nearly as fresh as river water.

To what are we to ascribe this striking difference between the saltness of the Baltic and of the ocean? Was it originally a lake of fresh water, and did the sea break in upon it? Even supposing this the case, one would have expected that long ere now the saltness of the Ocean would have diffused itself equably through the whole of the Baltic. That it has not done so affords a striking proof of the extreme slowness with which substances diffuse themselves through water by chemical affinity. It shows also that the waters of different seas keep much more completely separate than could have been anticipated. The distance between the Scaw and the Sound does not exceed 120 miles, yet the difference in the proportion of salt is enormous; the one containing nearly three times as much salt as the other. We do not know exactly the saltness of the Mediterranean; and still less that of the Black Sea and the Caspian. It were greatly to be wished that some person would favour us with the specific gravity of these seas. It would tend to throw considerable light upon the origin of the saltness of the sea; a problem which has exercised the ingenuity of philosophers for ages, without being yet resolved. The striking difference between the saltness of various parts of the Baltic, and between its saltness and that of the Ocean, is rather hostile to the opinion of Dr. Halley, who conceived that all the salt in the sea has been originally carried into it by rivers, and left when that water was evaporated. According to this theory the sea was originally fresh, and it is becoming salter and salter every day. But if we consider the great difference between the saltness of neighbouring seas, and the different kind of saline ingredients which exist in some seas, as the Dead Sea, we can hardly subscribe to the accuracy of this opinion. Neither is it likely that the sea was salt from the beginning, otherwise it would be impossible to account for the difference in the quantity of salt which exists in various seas, as this difference does not depend upon climate. For it appears from ac-

curate experiments made, that the Ocean is as salt in very high north latitudes as it is under the equator. The number of rivers running into the Baltic is considerable, and some of those that traverse the countries of Russia and Poland are of great size. The most probable opinion, though it is not satisfactory, is to derive the saltness of the Ocean from beds of rock-salt deposited at its bottom. On such a supposition we could account for the difference in the saltness of different parts of the Ocean by the greater or less abundance of these salt beds. But the subject for want of accurate knowledge of the saltness of inland seas is not yet ripe for discussion.

Sweden extends in length from about 55° 20′ up to 68°, or $12\frac{2}{3}$ degrees of latitude, which amount nearly to 900 English miles. The mean breadth can hardly be reckoned more than 200 English miles. So that the whole extent of surface may amount to little less than 180,000 square English miles. It is divided into three great districts, or kingdoms; namely, *Götaland*, which constitutes the southern part, *Svealand*, which is the middle district, and *Norrland*, which lies farthest to the north. In a former part of this book, I gave an account of the old provinces into which it was divided, because the names constantly occur in all Swedish books; but I have not yet said any thing of the new provinces, which usually take their name from the principal town in each. The shortest way to make the reader acquainted with these provinces will be to insert a table of the relative size of each, and of the portion of water which occurs in it. As the following table was constructed by Akrell, to whom we are indebted for a very accurate map of Sweden, it is probably as correct as any which exists:

| | Square miles Swedish. | | |
|---|---|---|---|
| Provinces. | Land. | Water. | Total. |
| Norbotten | 733·4 | 17·6 | 751 |
| Westerbotten | 653·6 | 14·4 | 668 |
| Vester Norrland | 212·5 | 4·5 | 217 |
| Jemtland | 407·6 | 17·4 | 425 |
| Norrland | 2007·1 | 53·9 | 2016 |

| Provinces. | Square miles Swedish. Land. | Water. | Total. |
|---|---|---|---|
| City of Stockholm | 0·15 | 0·03 | 0·18 |
| Stockholm | 64·04 | 3·34 | 67·38 |
| Upsala | 45·63 | 1·20 | 46·83 |
| Vesteros | 60·54 | 1·37 | 61·91 |
| Nyköping | 52·58 | 5·50 | 58·08 |
| Örebro | 68·21 | 6·06 | 74·27 |
| Carlstad | 140·50 | 7·50 | 148·00 |
| Stora Kopperberg | 279·00 | 9·00 | 288·00 |
| Gefleborg | 166·80 | 5·70 | 172·50 |
| Svealand | 877·45 | 39·70 | 917·15 |
| Linkoping | 93·3 | 5·7 | 99·0 |
| Kalmare | 97·1 | 0·9 | 98·0 |
| Iönköping | 92·4 | 3·3 | 95·7 |
| Kronoberg | 79·0 | 5·2 | 84·2 |
| Blekinge | 25·4 | 1·2 | 26·6 |
| Skoraborg | 75·1 | 2·9 | 78·0 |
| Elfsborg | 114·2 | 5·4 | 119·6 |
| Göteborg | 41·30 | 0·7 | 42 |
| Halmstad | 44·40 | 0·6 | 45 |
| Christianstad | 51·78 | 1·62 | 53·4 |
| Malmöhus | 38·00 | 0·6 | 38·6 |
| Gottland | 27·30 | 0·2 | 27·5 |
| Götaland | 779·28 | 28·32 | 807.6 |
| Vener, Vetter, Mälar, and Hjelmar, | | 85·2 | |
| Sweden | 3663.73 | 207·12 | 3870·85 |

To reduce the Swedish square miles in this table to English miles, we have only to multiply them by 44·4. For there are 44·4 English square miles in a Swedish square mile. This table shows us at a glance the great number of lakes which occur in every district of Sweden. A country rather more than one-eighteenth of the surface of which is covered with water, will be allowed, I presume, to be a very singular one; yet this is the case with Sweden. The surface of the Swedish lakes occupy no less a space than 4756 English square miles. These lakes consist of the purest and most transparent water, and serve not

only to beautify the country; but are a considerable resourse to the inhabitants, on account of the numerous fish which they all contain. The Vener may be considered in the light of an inland sea, which unites together the inhabitants scattered round its extensive shores; and now that the navigation of the Gotha is complete from Venersborg to Gottenburg, they enjoy nearly the same advantages with regard to commerce as if they were situated upon the sea side, while they are free from the inconveniences which attend that situation. The banks of the Vener all round are covered with wood, which grows luxuriantly down to the very water edge. Whereas all the sea coasts of Sweden, as far as I have seen them, and I travelled along the sea coast above a hundred miles, are quite bare. It is generally conceived that the neighbourhood of the sea is unfavourable to the vegetation of trees, on account of the salt with which the atmosphere is impregnated; some have even gone so far as to affirm that living in such situations produces the scurvy from the same cause. But such a theory can hardly apply to Sweden. For the Baltic contains so little salt that it may be almost considered as a fresh water sea. Yet its coast from Helsinborg eastwards, as far as I had an opportunity of seeing it, is as bare as the Scilly islands. It is more probable that the violent and nearly constant winds which blow along the sea coast are the cause why trees do not vegetate well in such a situation. It has never been proved that an atmosphere impregnated with salt (supposing such an atmosphere to exist on the sea coast) is injurious to the growth of trees; nor have I ever heard it alleged that at the salt lakes in America, where the atmosphere ought to be as much impregnated with salt as on the sea coast, trees do not grow as well as in other places. That it is owing to the winds, and not to any saline impregnation in the atmosphere, that trees do not grow well near the sea, I take to be evident from this circumstance, that if young trees planted by the sea side be surrounded by a wall, they grow as well as any where else, till they get as high as the top of the wall, and then they immediately begin to wither and decay. The wall cannot possibly prevent the trees

from coming in contact with the saline atmosphere if any such exist, but it effectually screens them from the wind, and as long as this screen continues, the neighbourhood of the sea has no injurious effect upon them.

When the canal intended to join the Vener and the Mälar shall be completed, we may conclude that the intercourse between the west and east coast of Sweden will be greatly promoted. Such a communication must be particularly advantageous in case of a war with Denmark, to which from the neighbourhood of that kingdom, and the rivalship and hostility which has so long existed between Sweden and Denmark, the Swedes are particularly exposed.

The Vetter is another lake which might be of great consequence to the commerce of Sweden, if the Swedes ever become a manufacturing nation. It connects Nerike with Smoland. The only use to which it is applied at present is to facilitate the conveyance of limestone, to be used in the smelting of the iron ore of Taberg. This limestone is conveyed in open boats to the lake on the south side of Iönköping, and is there distributed to the different smelting houses. I was sorry to see so large a lake, and apparently so deep, totally destitute of ships. This is probably owing to the nature of Smoland, which is the most barren, and consequently the thinnest inhabited province that I saw in Sweden.

Much more advantage is taken of the Mälar and Hjelmar, which lie in the most populous and important part of Sweden. Through the first of these at least a very considerable trade is carried on between Dalecarlia and Westmanland and Stockholm. If the Motala, which runs out of the northern extremity of the Vetter, and passes through Norköping, could be rendered navigable, it would greatly benefit all that part of Sweden which surrounds the Vetter, and bring that lake into the same situation as the Vener, which is indebted for its chief value to the large size of the river Gotha.

There is great reason to believe that the lakes in Sweden are diminishing in size, and that many of them will at last dry up. I saw several striking instances of this diminution, some of which I have

stated in a preceding part of this work. This diminution is attended with a corresponding diminution in the size of the Swedish rivers, most if not all of which originate from lakes. This diminution has become so striking at Upsala, that apprehensions are entertained that the river running through the city will soon be incapable of driving a corn-mill upon which the University depends for a considerable part of its revenue. A diminution in the size of the Baltic has ever been remarked by the Swedish writers, and demonstrated by evidence that to me at least appears incontestible. Some mineralogical writers conceive this diminution of water to be a general process going on in every part of the earth, and which in their opinion has been going on since the original formation of the earth. In their opinion there is a constant progress towards solidity, and the final termination of all things terrestrial will be brought about by the conversion of the whole water into firm matter. Such opinions are totally unsupported by any solid evidence; they include theories beyond the human understanding to discuss, and have no other tendency than to throw ridicule upon mineralogical speculations, and induce men of sound heads to abandon them altogether. Every thing involving speculations respecting the method employed by the Divine Being in governing the earth, and the ultimate objects which he has in view, ought to be abandoned as beyond our sphere, except when they can be supported by mathematical demonstration, or by authentic proofs of a divine revelation.

The rivers in Sweden are very numerous; but none of them are of any great size; unless some of the rivers far to the north, which I had no opportunity of seeing, be exceptions. The greatest river in South Sweden, and by far the most important, is the Gotha, which joins the lake Vener to the sea, and serves as the channel of communication between Vermeland and Gottenburg. It is a very respectable river in point of size, and at the falls of Trollhätta has a very picturesque appearance. The commerce on it is considerable, and must increase when the present canal cutting between the Vener and the Mälar is finished. The next river in point of importance is the Motala,

which runs from the Vetter, and making its way through several small lakes, flows through Norköping, and falls into the sea a little to the east of that city. From the lake Vetter to Norköping it is too inconsiderable to serve any other purpose than to embellish the country; which it does to such a degree, that the valley on its banks is one of the finest spots in Sweden, both in appearance and fertility. From Norköping to the sea it is of such a size as to admit vessels, and serves as an outlet to the commerce of this enterprising and manufacturing town.

The third river in point of importance is the Dal, which rises on the borders of Norway, and bends its course south-east through Dalecarlia, and falls into the Gulf of Bothnia. It is a large-looking river, and runs so slowly, that it has very much the appearance of a lake. From the floating-bridges fixed over it at Dalecarlia, it is obvious that it serves no useful purpose as a navigable river. Whether this be owing to its shallowness, or to the want of industry in those parts of Sweden through which it flows, I cannot say; but I should rather conceive the latter to be the cause.

The Clara is another river of considerable size, which rises not far from the source of the Dal, and running south through Vermeland, falls into the lake Vener. Its current is so slow, that it might pass for a lake; a proof of the great flatness of the country through which it runs. The Ljusne is another river of considerable size, which rises in the mountains between Norway and Sweden, and running east through the province of Gefleborg, falls into the Gulf of Bothnia about the 61st degree of latitude. The northern great rivers, all of which fall into the Gulf of Bothnia, are the Angerman river, which falls into the sea at Hernösand, about the $62\frac{1}{2}$ degree of latitude; the Umea, which rises from a great lake in West Bothnia, and falls into the sea at the town called Umea, a little to the south of the 64th degree of latitude; the Skelleftea, which likewise rises from a great lake in the same country, and falls into the sea about north latitude $64\frac{1}{2}^{\circ}$; the Pitea, which rises in the Lapland Alps, far to the west, about latitude

67°, and running in a south-easterly direction, falls into the sea at Pitea, a little to the north of the 65th degree of latitude; the Lulea, which rises from a long string of lakes in the Lapland Alps, and running nearly in a parrallel direction to the Pitea, falls into the sea at Lulea, at north latitude 65½°; and the Torneo, which, rising from a great number of streams finally uniting together, runs nearly due south, and falls into the northern extremity of the Gulf of Bothnia, at Torneo. Most of these Lapland rivers are inconsiderable in winter; being very imperfectly fed by the snow, which continues wrapt up in the state of ice. But in summer, when the snow melts, they swell prodigiously, and sometimes inundate a considerable track of country, as appears from the journey of Linnæus, detailed in a former chapter.

The country of Sweden, in general, is comparatively flat, though there occurs in it a range of mountains of very considerable height. These run north and south, separating Sweden from Norway, and are usually distinguished by the name of the Doffrine Hills. They may be said to commence at Gottenburg, and to run north along the west side of the Gotha, Dahlsland, and Vermeland. But the whole of this track is exceedingly low, so that a careless observer might overlook the hilly track altogether. The mountains become higher when they reach the confines of Dalecarlia, and they are highest of all in Jämtland, where the mountain Syltoppen occurs, by far the highest in Scandinavia. According to the most accurate measurement that has been made, its height is not less than 6652 feet. Oreskutan, in the same district, is 5308 feet in height. From Jämtland, as we advance northward, the mountains diminish in height, so that scarcely any of them is so high as 2000 feet, till we get somewhat farther north than the 67th degree of latitude, where the highest mountains of the Lapland Alps are situated. The highest of these is Sulitelma, which is 6178 feet in height. Olmajalos, in the same neighbourhood, is 5543 feet high. The range of mountains continues with little interruption, though with diminished height, to the North Cape, where it terminates in the Frozen Ocean.

From this range of alpine mountains there are several ranges of

high country that proceed, of little comparative height, but serving at least to direct the course of the rivers, and to add to the beauty of the country. The first of these begins at the city of Gottenburg, and running due east, passes a little to the south of the Vetter, taking in the mountain Taberg, formerly described. It continues in an easterly direction to Vimmerby, not very far from the Baltic; and then turning north, and diminishing so much in height as to be nothing more than perceptible, terminates a little to the south of Söderköping.

Another range of hills sets out from the alpine range, at latitude 63°, a little to the north of Dalecarlia, and taking a south-easterly direction, soon divides into two separate ranges. The first of these runs east by south, divides the valley of the Dal from that in which the Ljusne runs, and terminates near the sea, in latitude 61°. The second range takes a much more southerly direction, runs for many miles nearly parrallel to the great alpine chain, separates the valley of the Clara from that of the Dal, passes through Nerike, where it becomes very low; and when it has almost reached the north coast of the Vetter, it takes an easterly direction, and terminates at Tunaberg.

These, a very low range excepted, which runs from sea to sea, at the southern extremity of Smoland, are the only chains of hills to be found in Sweden. Several insulated hills occur, especially in West Gothland, where no fewer than twelve separate hills may be counted. Of these, the highest and most conspicuous is Kinnekulle, which is 920 feet above the surface of the sea. Halleberg and Hunneberg are likewise very conspicuous hills; though they are much lower than Kinnekulle. The rest of the country is in general wonderfully level. This is so strikingly the case, that all the way from Gottenburg to Stockholm, by the Örebro road, there is not a single pull nor declivity, till you come within a few miles of the capital. East Gothland and Smoland, however, are much more uneven; in consequence of which the roads are inferior in goodness; but the country is more pleasing to the eye. No part of Sweden, in this respect, is superior to the road along the east border of the lake Vetter. The beauty of this part of the country is very much owing to the extensive prospect which you

are always able to command. In short, in point of aspect, the kingdom of Sweden, as far as I had an opportunity of seeing it, may be compared to the south-east of England. The surface is by no means even; but as no hill of any height occurs in it, we must, notwithstanding, consider it as a flat country.

In point of structure, the whole kingdom of Sweden may be considered as primitive, with a very few exceptions. The great rock of which it is almost wholly composed, is gneiss, which here and there puts on the aspect of granite, and occasionally of mica slate. The flatness and slaty structure of this rock, extending in a uniform direction for so many hundred miles, deserves attention. It completely refutes the opinion of those who affirm, that granite is a rare rock, and that it occupies only a very small extent of country. The slaty structure and regularity of the beds are equally hostile to the opinion of those who maintain, that granite has been in a state of fusion. Nor can there be the smallest doubt that, in Sweden at least, it constitutes the lowest rock hitherto discovered, upon which all the other rocks are deposited. Besides gneiss and mica slate, there occur also many beds of primitive limestone, of hornblende, and perhaps also beds of primitive greenstone; though I did not meet with any such myself. Beds of quartz are also pretty common; though none of them, as far as I could observe, are of any considerable extent. I never met with a single bed of clay slate in any part of Sweden; and as I only saw two houses in the whole kingdom roofed with slate, I think we may conclude, that it is a very scarce rock in that country, and that the places in which it may occur are situated at a distance from water carriage. On the east side of the lake Vetter I saw beds of primitive porphyry. Serpentine sometimes occurs, mixed with primitive limestone; but never, as far as I have observed, in any great quantity.

From the above enumeration, it appears that almost all the rocks which belong to the primitive class occur in Sweden; that gneiss is by far the most common, and clay slate the most uncommon. Sienite, topaz rock, primitive flinty slate, and primitive gypsum, were no where observed by me; but it is very possible, notwithstanding, that they may occur in the country. The structure of the enormous chain of

mountains, which constitute the Scandinavian Alps, remains totally unknown. There is reason to consider them as primitive; for several of the subordinate chains which issue from them and traverse Sweden belong to the primitive class; and the rocks about Gottenburg, and northwards to the Vener, which may be conceived to be the commencement of the Scandinavian Alps, are all primitive.

With regard to the transition class of rocks, as far as my observations go, none of them occur in Sweden. There are, indeed, rocks to which the Swedes have given the name of transition rocks; but I have assigned my reasons in a preceding part of this work for believing them to belong to the class of floetz rocks, and I conceive that these reasons are quite conclusive.

The floetz rocks are not wanting in Sweden; though they occupy only a comparatively small space at least in those parts with which I am acquainted. It would be impossible to recognize in Sweden the Wernerian arrangement of floetz rocks. Indeed I conceive that the whole of the series of floetz rocks does not occur in that country, but only the rocks belonging to the floetz trap and to the independent coal formation. To these may be added chalk, which just makes its appearance in the south of Sweden; but is found in greater abundance in the island of Gottland.

The rocks which I conceive to belong to the floetz trap formation are widely distributed in Sweden. They occur in West Gothland, in Nerike, in East Gothland, and in Jämtland; and in all of these places exactly in the same order. The lowest bed is always sandstone, having a peculiar character. It is white and composed chiefly of grains of quartz. Over the sandstone lies a bed of alum slate, containing balls and thin beds of stinkstone, and also petrifactions. Over the alum slate lies a bed of floetz limestone, abounding in petrifactions. The uppermost bed of all is greenstone. It is always fine grained, so that it is not easy to distinguish by the eye what are its constituents. This greenstone is often wanting; in which case the uppermost bed is limestone. In Halleberg and Hunneberg, the limestone itself is wanting, but the hills notwithstanding are crowned with greenstone.

In the porphyry district of Dalecarlia the porphyry itself occurs

among these floetz rocks. In consequence of this situation it will be necessary henceforth to recognize porphyry as belonging to the class of floetz rocks, as well as to the primitive rocks. This is an extension of the Wernerian classification, which will probably be necessary with regard to several other of the primitive rocks. As Werner deduced his classification of rocks entirely from his observations in Saxony, we have reason to expect that a more extensive examination of the structure and position of rocks in other parts of the earth will disclose several new positions which do not exist in Saxony. It is even not unlikely that one of his primitive formations will hereafter be dropped out of the classification; I mean the topaz rock; which has hitherto been observed only in one place. Probably it is nothing else than a variety of some other known rock altered by the deposition of extraneous minerals in it. Were we to adopt a peculiar name for all rocks holding extraneous minerals within them, their number would become almost infinite; or at least too great to fit them for any useful purpose.

The independent coal formation occurs only at one place in the south of Sweden, namely, the neighbourhood of Helsingborg. The great rock in that part of the country is sandstone; but a careful examination enables us to detect the presence of almost all the coal metals which occur in the independent coal formation in Great Britain.

The only alluvial formations that are to be observed in Sweden are the different soils which cover the surface of the earth. These, as far as I observed them, are sand, clay, loam, and turf or peat. They are of consequence only in an agricultural point of view. They are obviously derived from the decomposition of the rocks in the districts in which they occur.

The metals which have hitherto been found in Sweden are eighteen in number; namely, gold, silver, mercury, copper, iron, tin, lead, zinc, antimony, nickel, arsenic, cobalt, manganese, tungsten, molybdenum, titanium, tantalum, and cerium. There are seven metals which have not hitherto been observed in that country; namely, platinum, palladium, rhodium, iridium, osmium, uranium, and tellurium. Of the seventeen metals found in Sweden there is one, namely, tan-

talum, which has hitherto been found no where else, except in a single specimen from America, which was analysed by Mr. Hatchett, the original discoverer of this metal, to which he gave the name of columbium. Cobalt, nickel, molybdenum, manganese, and cerium, were originally discovered to be peculiar metals in Sweden. Of these the most abundant and valuable in that kingdom is cobalt, which occurs in the mine of Tunaberg, and in some mines in Westmanland, and probably also in Nerike. Nickel is a very scarce metal, and has been very rarely found in Sweden. The same observation applies to the manganese of Sweden which is rather scarce. I have enumerated several localities in the preceding part of this work. As to molybdenum and cerium they are likewise scarce; but as they have not hitherto been applied to any useful purpose, little attention has been paid to ascertain their localities. The same observations apply to titanium and tungsten.

Arsenic occurs as usual united to other metals, especially to cobalt; but it is not applied to any useful purpose. Neither is zinc, which is found along with the ores of lead, and sometimes mixed with magnetic iron ore, as in the mine of Dannemora. Tin has only been found in the state of minute crystals at Fahlun, and of course can be considered only as a curiosity. Mercury is equally uncommon. It was found in the state of amalgam of silver in the lead mine of Sala. The same observation applies to antimony, which likewise occurs in the mine of Sala occasionally in a metallic state. Gold has only been found in the gold mine of Adelfors in Smoland. Silver has been occasionally found native, and it is always mixed, in a greater or smaller amount, with galena.

The only metals which occur in any considerable quantity in Sweden and the ores of which are worth working, are lead, copper, and iron. Lead is the scarcest of the three; though there are several mines of it wrought in Sweden, the most important of which is the mine of Sala. Copper is more abundant. The great depot of copper in Sweden is Dalecarlia. But several other places where it occurs have likewise been mentioned in the preceding work. The ore of this metal which usually occurs in Sweden is copper pyrites.

But iron is the metal in which Sweden is peculiarly rich, and which may in fact be considered as its staple article. Ores of iron occur in every country, and in every formation. But from the example of Sweden it would seem that the best ores occur chiefly in the primitive classes of rocks. The worst ores of iron are the bog ores. These are very common in France; but they yield bad iron. Clay ironstone, which is the ore chiefly wrought in Great Britain, yields good iron; though probably inferior in quality to the ore furnished by the magnetic ironstone, employed in Sweden. To give the reader an accurate idea of the number of iron mines and forges in Sweden, I insert the following table.

| Counties. | Iron mines. | Produce of the ore in Skeppunds. | Smelting furnaces. | Forges. | Privileged iron works till the 15th June, 1803. | | Total produce in iron. |
|---|---|---|---|---|---|---|---|
| | | | | | Iron bars, in Skeppunds. | Coarse iron utensils, in Skeppunds. | |
| Vesterbotten ..... Norbotten ..... | 2 | 2000 | 4 | 7 | 2595 | ..... | 2595 |
| Wester Norrland .... | ... | ..... | 5 | 15 | 9539 | 1469 | 11008 |
| Norrland ..... | 2 | ..... | 9 | 22 | 12134 | 1469 | 13603 |
| Stockholm ..... | 6 | 5751 | 6 | 5 | 10970 | ..... | 10970 |
| Upsala ..... | 19 | 72940 | 13 | 9 | 24646 | 1585 | 26231 |
| Vesteros ..... | 17 | 100516 | 31 | 49 | 42339 | 1077 | 43416 |
| Nyköping ..... | 12 | 81482 | 8 | 22 | 12854 | 1946 | 14800 |
| Örebro ..... | 55 | 164431 | 82 | 64 | 53548 | 5167 | 58715 |
| Carlstad ..... | 35 | 126818 | 35 | 69 | 66214 | 1974 | 68188 |
| Stora Kopparberg .. | 20 | 146000 | 72 | 56 | 32712 | 4932 | 37644 |
| Gefleborg ..... | 6 | 21168 | 30 | 47 | 43365 | 905 | 44270 |
| Svealand ..... | 170 | ..... | 277 | 321 | 286648 | 17586 | 304234 |
| Linkoping ..... | 3 | 3000 | 13 | 25 | 13693 | 1906 | 15599 |
| Kalmare ..... | ... | ..... | 10 | 13 | 6505 | ..... | 6505 |
| Iönköping ..... | 1 | 8000 | 14 | 11 | 4775 | 517 | 5292 |
| Kronaberg ..... | ... | ..... | 13 | 10 | 3366 | 323 | 3689 |
| Skoraborg ..... | ... | ..... | 2 | 9 | 6043 | 112 | 6155 |
| Elfsborg ..... | ... | ..... | ... | 10 | 5289 | 3949 | 9238 |
| Götaland ..... | 4 | ..... | 52 | 78 | 39671 | 6807 | 46478 |
| Total ..... | 176 | ..... | 338 | 421 | 338453 | 25862 | 364315 |
| New works since the 15th June, 1803... | ... | ..... | ... | ... | 47257 | 19565 | 66822 |
| Grand total .. | ... | ..... | ... | ... | 385710 | 45427 | 431137 |

N. B. A skeppund is three hundred weight nearly.

From this curious table it appears that the whole annual produce of wrought iron in Sweden does not much exceed one million of hundred weights. By far the greatest part of this quantity is in the state of bars, and of course obviously intended for exportation. We see likewise how much the produce of their iron mines has increased since the year 1803. But it would appear from what I saw in Stockholm that much more iron has been manufactured in Sweden than can be sold at the price which is demanded. For the quantity of iron collected in that capital was quite enormous. Hence we may predict a diminution in the number of forges and in the quantity of iron manufactured in Sweden. A comparison of the number of forges with the quantity of iron produced serves to show us on how small a scale these forges are wrought. Perhaps this may be one reason of the superiority of the Swedish iron to that of other countries. Our leather in Great Britain was better than it is at present, when every shoe-maker tanned his own leather. But the profits to the manufacturer were much smaller; nor have I any doubt that this is the case with the manufacture of iron in Sweden.

Thus it appears from the preceding table that the number of iron mines actually wrought at present in Sweden amount to 176. These supply 338 smelting furnaces. So that at an average there are about two smelting furnaces to every mine. The forges are still more numerous.

As to the minerals that occur in Sweden it cannot be expected that I should be able to give a very exact detail of them. But all that I had any opportunity of seeing, or even hearing of, have been mentioned in a preceding part of this work; and they are not so numerous as to require recapitulation. The only minerals peculiar to Sweden, that I recollect at present, are gadolinite, the ores of tantalum, and cerite. Perhaps there may be one or two stony minerals that have not yet been detected in any other country, but of that I am not quite certain.

The climate of Sweden is much milder than could be expected from the high northern latitude in which it is situated. The winter is not

so cold as in the countries in the same latitude, situated farther to the east; yet the mean temperature of the summer does not seem to be inferior. This is probably owing to the sea, which surrounds it on all sides, and reduces it nearly to the state of an island. While at the same time this sea is so narrow, and so completely surrounded by land, that in summer it is heated to so high a temperature as not to prevent the countries in its neighbourhood from acquiring the full effect of the summer heat. A good method of showing the difference between the climate of Sweden and Russia, will be to give a table of the mean temperature of each month of the year in Stockholm and Petersburgh, cities situated nearly in the same latitude, and nearly at the same distance from the sea. Both tables are taken from the registers kept in the two capitals, by the Academies of Sciences, who hold their meetings in the respective cities. The Stockholm register is the mean of 50 years, the St. Petersburg of 20 years. So that both are for a period sufficiently long to give very nearly the correct mean.

| | Mean height of Fahrenheit's thermometer at Petersburg. | Stockholm. |
|---|---|---|
| January | 12·1° | 24° |
| February | 16·1 | 26·5 |
| March | 22 | 29·5 |
| April | 35·5 | 38·5 |
| May | 43·5 | 52·5 |
| June | 54 | 59·5 |
| July | 64·6 | 64 |
| August | 61·5 | 58·5 |
| September | 51 | 50·7 |
| October | 39·4 | 41·5 |
| November | 27·4 | 31·5 |
| December | 18·4 | 26·5 |
| Annual mean | 37·1 | 41·93 |

From this table it appears that the mean temperature of Stockholm is much higher than at St. Petersburg: the difference in favour of the

first capital amounting nearly to four degrees; but this difference falls chiefly upon the winter. The mean temperature of the six winter months in the two capitals is as follows:

| | |
|---|---|
| In Stockholm ..... | 29·4° |
| In Petersburg ..... | 21·9 |
| Difference..... | 7·5 |

Here the difference in favour of Stockholm is not less than seven and half degrees. The summer six months on the other hand give the following results:

| | |
|---|---|
| In Stockholm ..... | 54·4° |
| In Petersburg ..... | 52·4 |
| Difference..... | 2 |

Here the difference amounts only upon the whole to two degrees. It appears from the table that the mean heat of July and August, the two warmest summer months, is greater in Petersburg than in Stockholm. The mean of these in the two capitals is as follows:

| | |
|---|---|
| In Stockholm..... | 61·25° |
| In Petersburg..... | 63·05 |

Here the difference in favour of Petersburg is 1·8°.

We see from the table that there are seven months in the year, from April to October inclusive, when the thermometer stands at a mean above the freezing point; and five months when the mean temperature is below the freezing point. The coldest month in the year is January, the mean temperature of which is 24°; the hottest month July, the mean temperature of which is 64°.

The winter in Sweden is considered by the inhabitants as peculiarly pleasant. The country is covered with snow for several months; and the thermometer never rises above the freezing point. The roads are always dry. And as winter in that climate is not accompanied with violent winds, travelling is both rapid and agreeable, as the travellers are able to keep themselves warm by means of clothing. All persons

without exception, with whom I have conversed on the subject, declare that they consider the winter in Sweden as much more pleasant than in Great Britain. Our weather is seldom very cold: indeed the thermometer, even during winter, is much more frequently above the freezing point than below it. The consequence of this, and of the frequent rains which fall, is that the roads and streets are almost always wet and disagreeable, and much walking exceedingly inconvenient.

The summer in Sweden is in general pleasant. June, July, and August may be considered as the summer months, and the weather at that season, as far as the feeling is concerned, is as hot as in Great Britain. The greatest height to which the thermometer rises in Stockholm is 84°. The month of October must be classed with the summer months, and April with the winter.

That the temperature of Skonia is higher than that of Stockholm, is sufficiently obvious from the plants which grow in both places; but I have never had an opportunity of drawing an accurate comparison between them, as I have never seen any register of the weather kept in the south of Sweden. The temperature of the northern parts of Sweden has been sufficiently explained in a preceding chapter.

From the flatness of the country, the smallness of the rivers, and the apparent diminution of the lakes, there is reason to believe that the quantity of rain which falls annually in Sweden is not great. This agrees with the registers which I have seen. The following little table exhibits the depth of rain in English inches, which falls annually in the southern, middle, and northern districts of Sweden:

| | Rain. |
|---|---|
| Lund ..... | 18·29 inches. |
| Upsala ..... | 15·37 |
| Uleaborg ..... | 14·35 |

From this table it would appear that the mean quantity of rain which falls annually in Sweden, amounts only to 16 inches. But the places selected lie all towards the east coast. It is probable that on the west

coast, and in the neighbourhood of the mountains which separate Sweden from Norway, the annual fall of rain will be much greater. At Gottenburg, for example, we were told that it rained much more frequently than at Stockholm, and for my part I experienced the truth of the observation while I was in that city. Lund is nearly in the same latitude as Edinburgh. Now the annual quantity of rain which falls in that city is about 28 inches. And the same excess of rain will be found in every part of Great Britain. Great Britain then, there is every reason to believe, is much more rainy than the part of the continent opposite to it, and in the same latitude. This is probably owing to the very changeable nature of our weather, and the perpetual alternation of two opposite winds of very different degrees of temperature. For Great Britain constitutes the field of battle, as it were, between the north east and south west winds which are perpetually struggling for the mastery; and when they are mixed together during the course of these struggles, the difference of their temperature is such, that the precipitation of rain seems to be a natural and unavoidable consequence.

Such being the climate of Sweden, and its summer lasting nearly five months, we need not be surprised that it produces most of the plants which vegetate in Great Britain. Those plants indeed which cannot endure a mean temperature of 24° for a month or longer, are of course wanting. Hence broom and furze are no where to be seen in Sweden. Hence the chestnut tree, which constitutes so great an ornament of our pleasure grounds, is not to be observed in that country. Neither did I see any specimen of the walnut tree; nor did any beech occur till I was farther south than Iönköping. But the oak, the elm, and the alder thrive as well in Sweden as in Great Britain. Sweden is the native country of the birch, the poplar, the willow, the spruce fir, and the Scotch fir, which thrive better in no part of the world than in Scandinavia; and go much farther to the north than those parts of the country which I visited. Fruit trees are no where more abundant nor more productive. I saw prodigious loads of cherries, and abundance of apples and pears. Plums also I saw green on the tree, and I

presume they ripen in common seasons, though that was not the case in the autumn of 1812. Sweden produces no other fruit, unless gooseberries, currants, raspberries, and strawberries are entitled to that name. Of these Sweden furnishes a great profusion. Indeed all of the plants grow wild in the country. There are other species of berries still more common if possible; as the juniper, the bilberry, the whortleberry, and the cranberry, which cover the whole surface of the heaths and woods.

By far the most common species of grain cultivated in Sweden are rye and barley. Oats also are cultivated in considerable quantity. The south of Sweden produces a good deal of wheat; but it is not much cultivated in the other parts of the country. I am persuaded, however, that wheat might every where be substituted with great advantage for rye. It yields a much more productive crop, and makes incomparably better bread. It would stand the climate of Sweden sufficiently well, at least as far north as latitude 60°; for it was as far north as that nearly that I saw an admirable field of wheat ripe in 1812, one of the coldest summers ever remembered in Sweden. The Swedish summer is quite warm enough, and long enough to ripen wheat sown the preceding autumn: while the coating of snow, which covers the face of the country in winter, would prevent the cold from injuring the crop. There is indeed one objection to the cultivation of wheat in Sweden. The number of cattle which the peasants keep is not sufficient to produce enough of manure to do justice to their fields. Now unless a sufficient stock of manure could be obtained, it would be useless to attempt the cultivation of wheat. If it be the coldness of the climate which prevents the Swedes from cultivating wheat; nothing can be a greater mistake than to suppose that there is not heat enough to ripen that species of corn. I remember when it was the opinion of the farmers that the climate of Perthshire, in Scotland, was too cold for raising wheat; yet at present fully as good crops of wheat are raised in that county as in any part of Great Britain. Now the summer is as hot in Sweden as in Perthshire. The winter indeed is much colder,

but this I conceive makes little difference, as the fields are protected from the cold by a covering of snow.

Very few turnips are raised in Sweden, and still fewer peas and beans. But the scarcity of these articles is not owing to the climate, but to the want of skill in the farmers. The introduction of the turnip usbandry would be a great improvement in Sweden. It would enable the farmers to keep a sufficient quantity of cattle, and thus to cultivate their fields in perfection, which they are unable to do at present. I am persuaded that if a British farmer of skill and capital were to take a large farm in Sweden, he would speedily realise a great fortune. It is well known that capital always meets with the best return in those countries that have the least capital. Now Sweden in this point of view I conceive to be a good object of speculation both to the farmer and iron master.

The face of the whole country of Sweden, with very few exceptions, is a complete forest, similar, I presume, to North America; with this difference, that in Sweden the trees are all small, and consist chiefly of pines and birches.

The domestic animals in Sweden are the same as those that occur in this country. The ass indeed, as far as my observations went, is not to be found there; but horses, black cattle, sheep, goats, dogs and cats are to be seen every where. The Swedish breed of horses is small; but they are handsomely shaped, with the exception of the eye which is generally dull. The most common colour of the horse is dun. They have all long tails. Geldings only are used for carts and carriages; indeed I did not happen to see any stallions in the country. The horses are all very docile, nimble, and remarkably sure footed. I never saw one of them stumble; though I must have employed several hundreds in the course of my journey. This smallness of the breed of horses must have been caused originally by a deficiency of food. It would be absurd to ascribe it to the rigour of the climate; because the Swedes themselves are not inferior in point of stature to other nations. In former times the horses must have been greatly pinched for want of

food during the winter. Indeed this must be the case at present, unless they be able to lay in a sufficient stock of hay and oats to last them during that season.

The black cattle are likewise rather small, though I think not quite so much so as the horses. It is very common to see them without horns. The sheep are remarkably small; not larger certainly than the Welch breed. They are exceedingly tame. I had occasion to see repeated flocks of them driven to Stockholm by women. I have seen the sheep surrounding the woman on the road, licking her hand, and behaving with as much familiarity at so many dogs. The wool of these sheep is coarse; but it serves for the coarse woollen manufactures of the country: all the cloth worn by the higher ranks is brought from other countries. The mutton is in general very lean, but well flavoured; indeed nearly as much so as venison.

Goats are not numerous. I never saw a flock of them; but merely one or two kept tame, as is usual in stables in this country. Sweden is too flat a country for goats. Swine are very abundant every where, and the Swedish mode of feeding them is disgustingly filthy. The dogs and cats do not differ from those of this country, except in being much tamer. I have repeatedly gone up and patted the head of a watch dog kept chained to protect a house or yard. Such an attempt in this country would be not a little hazardous. The cats frequently make up to you though a perfect stranger; and I have seen repeated instances of their following you through the fields like a dog.

The only wild quadrupeds of prey in Sweden are wolves, foxes, and bears in the northern parts. These animals (the wolves and foxes) are not so fierce as they are in the southern parts of Europe. The wolves seldom or never venture to attack a man, or even a large quadruped. During winter they frequent the road side, and seem in some measure to support themselves by devouring the dung of the horses who drag the sledges. Hares, squirrels, beavers, &c. likewise abound in Sweden. The hares become white in winter. The rabbit, as far as I could learn, is scarcely found in Sweden, except in a tame state.

Of birds there are about 300 species which occur in Sweden. In

the third chapter of this work I have given a catalogue of a considerable number of them. It would be needless to recapitulate that table here. I may mention, however, that all kinds of game are exceedingly abundant, as partridges, grous, woodcocks, &c. You meet with them every where served up as a common article of food.

Fish are very numerous in Sweden. Of sea fish, the one that struck me most, because I had never seen it before, was a kind of small herring called *strœmming* (*clupea harengus*, β). Though it be considered only as a variety of herring, I have no doubt that it is in reality a distinct species. As its taste and appearance are fully as different from that of the herring as the sprat or the pilchard. The strœmming is peculiar to the Baltic, and occurs in prodigious quantities. The principal river fish are the salmon and the pike. I never saw any trout, and am told they are not to be found in the Swedish rivers except among the mountains.

# CHAPTER XXII.

## POLITICAL VIEW OF SWEDEN.

History of Sweden—Swedish Conquests—Present Territories—Number of Inhabitants—Revenues—Constitution—Army—Resources—Agriculture—Quantity of Land cultivated, and its produce—Number of Horses, Cattle, and Sheep—Manufactures—Iron—Copper—Wood—Tar, &c.—Trade—East India Monopoly—Situation of Sweden with respect to other Nations, as Russia, Denmark, Britain, France—Her present Interest—Conduct of the Crown Prince—Object which he ought to pursue.

THE ancient state of Sweden is but imperfectly known. It is probable, from the striking similarity of language, that the Swedes and the Saxons who conquered England after the destruction of the Roman power were either the same people, or at least intimately connected with each other. Sweden was converted to Christianity during the eleventh century by Missionaries from England. It consisted originally of two separate kingdoms; namely, Svealand and Götaland, which were united together in the 13th century, by the extirpation of the Gothic race of kings. In the 14th century Denmark, Norway, and Sweden fell under the power of the famous Margaret, the Semiramis of the north, who was the daughter of Waldemar, King of Denmark. She succeeded to the throne of Denmark on the death of her father. Norway fell under her dominion by the death of Haquinus her husband, who was king of that country. She defeated Albert, King of Sweden, in battle, took him prisoner, and conquered his kingdom. She procured

the famous treaty of Kalmar to be concluded, by which the three kingdoms were for ever united under one sovereign. This treaty was injurious to the interests of the Swedes, subjecting them to a Danish sovereign, and was borne by that high spirited people with considerable impatience.

Margaret was succeeded in her sovereignty by Eric, of Pomerania, her nephew, who married a daughter of Henry IV. of England. The Swedes threw off the Danish yoke, and chose Carl Knuteson for Protector. He was twice displaced to make way for the Danish Kings, and as often restored. After his death Steno Sture, a nobleman of ancient family and great abilities, was made Protector. He was driven out by the Danes, and the union of the crowns renewed. But the Swedes again freed their country, and restored the protectorship to Steno Sture, who transmitted it to his son Svante Sture. He was succeeded by his son Steno Sture, who being slain in battle, Christian II. King of Denmark and Norway was advanced to the Swedish throne.

The tyranny of this King becoming intollerable, Gustavus Vasa emerged from one of the mines in Dalecarlia, and putting himself at the head of a party of Dalecarlians was speedily joined by the whole Swedish nation, and expelled the Danes from the kingdom with remarkable ease. The Swedes rewarded the heroism of Gustavus with the kingdom which he had rescued, and declared the throne hereditary in his family; thus changing Sweden from an elective to an hereditary monarchy. The family of Gustavus still continues to occupy the throne of Sweden, and during a period of nearly 300 years have produced a greater number of sovereigns of abilities than any other royal family in Europe. We have seen within these few years the melancholy close of this heroic family upon the throne of Sweden; and what makes the spectacle still more disagreeable if possible, we must acknowledge the necessity the Swedes were under to act as they did.

Gustavus Vasa ascended the throne about the year 1521. He had the merit of introducing the reformed religion into Sweden. He considerably reduced the revenues of the Swedish bishops, who had greatly distinguished themselves as leaders of the Danish faction, and had con-

tributed much to foment the troubles in which Sweden had been for so long a period involved. Gustavus was succeeded by his son Eric, whose history has been given in a former part of this work. He was supplanted by his brother John, who attempted, though without success, to restore the Roman Catholic religion in Sweden. He was succeeded by his son Sigismund, King of Poland; who was soon afterwards dethroned, and Charles IX., fourths on of Gustavus Vasa, was placed upon the Swedish throne. Charles IX. was succeeded in 1611 by his son Gustavus Adolphus, the greatest warrior of his time. His first exploits were directed against Russia and Poland. He afterwards assumed the defence of the Protestant cause in the north of Germany against the Emperor, and after the most splendid success was slain at the battle of Lutzen, and was succeeded by his infant daughter Christina. This queen after reigning some years surrendered her crown to Charles X. Gustavus, her cousin, who was Duke of Deuxponts, and had succeeded Gustavus Adolphus as commander in chief in Germany. He died in 1660, and was succeeded by his son Charles XI. The eventful reign of his son Charles XII. who succeeded to the throne in 1697, and was slain in 1718, is well known to every reader.

Charles XII. was succeeded by his sister Ulrica Eleonora, who in 1721 abdicated in favour of her husband Frederic, Prince of Hesse Cassel. He was succeeded in 1751 by Adolphus Frederic, Bishop of Lubec, descended from Catharine, the daughter of Charles IX. Gustavus III. his son, succeeded him in 1771. He was assassinated in March 1792, and was succeeded by his son Gustavus IV. Adolphus, who was dethroned in 1810, and succeeded by his uncle Charles XIII. the present King of Sweden. Such is a list of all the sovereigns of the house of Vasa, who filled the Swedish throne from the year 1523, when Gustavus Vasa was crowned, down to the late revolution, which has excluded that family from the throne of Sweden.

These princes, during the early part of the dynasty increased the size of their dominion on all sides. They drove the Russians from the coast of the Baltic, and the Gulf of Finland, and took possession of all the maritime provinces, as far south as Prussia. The victories of

Gustavus Adolphus, and the treaty of Munster put them in possession of Pomerania, Bremen, and Verden; and gave them a vote in the Diets of the Empire and Circle of Lower Saxony. Charles X. drove the Danes from Skonia and Smoland, and thus reduced the whole of the peninsula under the dominion of Sweden. He likewise conquered the country to the north west of Gottenburg, beyond the river Gotha, and thus secured Sweden from all risk of invasion from Norway. Such was the size of the Swedish empire when in its greatest glory, and such the power to which it was raised by the house of Vasa. Its dominions almost surrounded the whole coast of the Baltic on every side; so that the Swedes not only enjoyed the whole command of the Baltic, but the whole commerce which was carried on in it.

Such a state of things, however, could not continue. All the neighbouring nations were irritated without being subdued, and laid hold of every opportunity to renew the war which promised them the chance of success. The death of Charles XI., and the succession of Charles XII. to the crown, a youth under twenty years of age, were seized upon with avidity. Russia, Poland, and Denmark united together, and invaded the Swedish dominions. The result of this invasion, and the magnanimous conduct of Charles are well known. He defeated the Russians, dethroned the King of Poland, and threatened the King of Denmark in his capital. He might have obtained peace on his own terms, and secured the superiority of Sweden in the north for many years to come. But his want of moderation proved his own ruin, and destroyed the superiority of Sweden in the north. Instead of dethroning the Emperor of Russia, he was himself defeated, and Russia immediately recovered all her provinces on the east coast of the Baltic. The prudent Peter I. Emperor of Russia, to introduce commerce and civilization among his subjects, laid the foundation of Petersburg, made it his capital, and secured to his country the future possession of the coast of the Baltic. Since that period all the wars of the Swedes have been defensive. The Russians, in consequence of the wise policy of Peter I., soon became an overmatch for them. They have been continually adding to their dominions during the whole of the last century, and

have now risen to the rank of one of the most powerful nations of Europe.

Sweden, however, though deprived of her conquests, ran no risk of losing any integral part of the kingdom. Finland, indeed, had always been an object of ambition to the Russians, and from its position ought more naturally to have constituted a part of Russia than of Sweden. But from the nature of the country it might have been easily defended, and it would have been very difficult for the Russians to have made any great exertions to subdue it. But from the impolitic conduct of the late King of Sweden, and the treachery of some of the Swedish nobles, Finland was subdued, and Sweden thus stripped of nearly a third part of what constituted the original kingdom. The French Emperor drove them out of Pomerania without any regard to his own treaty or to justice; because he could not prevail upon them to enter heartily into the war against Great Britain; in which it was his declared object to involve every nation in Europe. Thus Sweden is at present reduced to the narrow, but long, country, situated between Norway on the one hand, and the Baltic and the gulf of Bothnia on the other. But if the territories of Sweden have been diminished, she has acquired in recompense a degree of security against the encroachments of her neighbours which she did not possess before. For Sweden may be considered nearly in the light of an island; since, except on the side of Norway, she can only be attacked by sea; and the population and resources of Norway are too small to occasion any uneasiness. The loss of Finland is to be regretted as a diminution of her population. The Finlanders were fully as warlike as the Swedes, and they seem to have a superiority over them in industry. But these disadvantages are scarcely a balance to the additional security which Sweden has thence derived, and to the consequent diminution of their expenses, as far as it is necessary to provide for the security of their country.

The number of inhabitants in Sweden bears no proportion to the size of the country, nor to the number of persons which it is capable of supporting, if properly cultivated. The population of each district

will be best seen from the following table, which exhibits the population of Sweden in 1811.

| Provinces. | Towns. | Farms. | Inhabitants. | | | | Inhabitants of towns to those of the country, as 10 to | Inhabitants in a square mile Swedish. | Operative farmers. | Yearly increase of inhabitants per 100. | Deaths one in |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | In the towns. | In the country. | Total. | On the farm. | | | | | |
| Norbotten | 2 | 522·8 | 1846 | 31474 | 33320 | 60 | 170 | 44 | 22824 | 1·8 | 44 |
| Vesterbotten | 1 | 694·5 | 1010 | 33851 | 34861 | 48 | 335 | 52 | 23870 | 1·8 | 44 |
| Vesternorrland | 2 | 1563 | 3313 | 56371 | 59684 | 36 | 170 | 274 | 36812 | 1·2 | 51 |
| Jämtland | 1 | 945 | 177 | 31058 | 31235 | 32 | 176 | 73 | 20281 | 1·2 | 51 |
| Norrland | 6 | 3725·3 | 6346 | 152754 | 159100 | 41 | 240 | 77 | 103787 | 1·5 | 47 |
| City of Stockholm | 1 | ..... | 72652 | ..... | 72652 | .. | 13 | .... | ..... | 0·6 | 25 |
| Stockholm | 6 | 4056·2 | 4563 | 94814 | 99377 | 23 | 207 | 1483 | 58649 | 0·5 | 38 |
| Upsala | 2 | 3548·7 | 6071 | 78070 | 84141 | 22 | 129 | 1790 | 48657 | 0·5 | 41 |
| Vesteros | 4 | 2852 | 7801 | 77007 | 84808 | 27 | 98 | 1368 | 49063 | 0·3 | 36 |
| Nyköping | 7 | 3276 | 6719 | 92042 | 98761 | 28 | 137 | 1708 | 59791 | 0·8 | 44 |
| Örebro | 4 | 2774·7 | 5483 | 94945 | 100428 | 34 | 173 | 1357 | 61720 | 0·7 | 39 |
| Carlstad | 3 | 1708 | 4290 | 135810 | 140100 | 79 | 317 | 946 | 92592 | 0·8 | 45 |
| Stora Kopparberg | 3 | 1792 | 5981 | 118825 | 124806 | 65 | 198 | 433 | 79313 | 0·7 | 47 |
| Gefleborg | 3 | 2089 | 8794 | 76590 | 85384 | 36 | 87 | 496 | 50024 | 1·0 | 50 |
| Svealand | 33 | 22096·6 | 122354 | 768103 | 890457 | 35 | 63 | 927 | 499809 | 0·6 | 40 |
| Linkoping | 5 | 5458 | 15500 | 147359 | 162859 | 26 | 95 | 1645 | 94164 | 0·7 | 39 |
| Kalmare | 3 | 3347 | 6853 | 129443 | 136296 | 38 | 189 | 1391 | 83404 | 0·7 | 38 |
| Iönköping | 3 | 3905 | 4556 | 112825 | 117381 | 28 | 248 | 1235 | 76115 | 0·8 | 40 |
| Kronoberg | 1 | 2837·2 | 1188 | 88443 | 89631 | 31 | 744 | 1067 | 56010 | 0·9 | 43 |
| Blekinge | 3 | 1089 | 14647 | 52553 | 67200 | 49 | 36 | 2546 | 31522 | 0·9 | 37 |
| Skaraborg | 6 | 4804 | 4668 | 133742 | 138410 | 27 | 286 | 1775 | 89910 | 0·4 | 40 |
| Elfsborg | 5 | 4209 | 5694 | 150577 | 156271 | 35 | 264 | 1313 | 102715 | 0·4 | 39 |
| Göteborg | 5 | 2783 | 24858 | 94656 | 119514 | 34 | 38 | 2846 | 66409 | 0·5 | 35 |
| Halmstad | 5 | 2922 | 4515 | 69079 | 73594 | 23 | 153 | 1635 | 47485 | 0·6 | 40 |
| Christianstad | 3 | 3002 | 4274 | 116273 | 120547 | 38 | 272 | 2274 | 79331 | 0·8 | 45 |
| Malmohus | 7 | 4033 | 17253 | 132639 | 149892 | 32 | 77 | 3944 | 95637 | 1·0 | 41 |
| Gottland | 1 | 1098·5 | 3819 | 29169 | 32988 | 26 | 76 | 1221 | 17560 | 0·9 | 49 |
| Götaland | 47 | 39487·7 | 107825 | 1256758 | 1364583 | 31 | 116 | 1697 | 840262 | 0·7 | 40 |
| Sweden | 86 | 65309·6 | 236535 | 2177615 | 2414150 | 33 | 92 | 624 | 1443858 | 0·8 | 43 |

From the preceding table it appears that the present population of Sweden amounts to 2,414,150. Norrland is the worst inhabited district, as might be expected from its situation, and the kingdom of Gothland is by far the best inhabited. The following little table exhibits the number of inhabitants to the English square mile in each of the great divisions:

Norrland..... 1·75 inhabitants per square mile.
Svealand..... 20·89
Götaland..... 38·22

The population of England amounts at present to 196·3 per square mile, so that England is nine times as populous, comparing the extent of the countries, as Sweden. The population of Holland, and of some parts of Italy, compared with the extent, is still greater than that of England. It is not possible for Sweden, if we take into view the climate of her northern parts, ever to rival England, or the southern nations of Europe, in extent of population. But there can be no doubt that she could maintain a much greater population than she does, and that it would be the interest of her government to promote the better peopling of the country by every means in her power. One of the most obvious methods would be to promote the settlement of farmers in Sweden, by holding out lands to them at a very easy rent. This would at once increase the quantity of food, which has a natural tendency to promote marriage, and thus to encourage population.

From the table it appears that the proportion of inhabitants living in towns is to that living in the country as 1 to 9. This is a very small proportion indeed. I presume I am within bounds when I say that in Great Britain almost one-half of the inhabitants live in towns, and I believe the proportion to be still greater in Holland and France. Yet it does not appear, notwithstanding this enormous difference in favour of Sweden, that it is so healthy a country as England. For the average number of deaths in Sweden is 1 in 43, while in England it is 1 in 49, and in Wales 1 in 60. This is a striking proof that the state of nature, in which a great part of Sweden is allowed to lie, is not so favourable to health as the cultivated state of England. Indeed this is what one would expect. The marshes, the swamps, the damp forests of the one, must be much more injurious to health than the dry corn-fields or pasture grounds of the other. A country covered with wood, indeed, is not so unhealthy in a cold as in a warm climate; yet even in the coldest climate it must occasion stagnations of water, and induce a certain degree of humidity in the atmosphere, which cannot but be more

or less injurious to the health of the inhabitants. That it is not the coldness of the climate which occasions an inferiority in point of healthiness, is obvious from this circumstance, that the rate of mortality is considerably less in the northern than in the southern parts of Sweden; as any one may satisfy himself, by inspecting the table.

Another very striking fact exhibited by the preceding table, is the slow rate at which the population increases. The mean for the whole kingdom is 0·8 per cent. or the population of Sweden doubles in 125 years. In England, the population doubles in 79 years; or the annual rate of increase is 1·264 per hundred. Norrland, however, increases at a much greater rate than the south of Sweden. In it the population doubles in 67 years. This is the natural consequence of its being so thinly peopled, and affords a convincing proof, that the circumstances of the inhabitants of that northern district are better than in any other part of Sweden; which accords with the information that has been given by those travellers who have visited Lapland.

We see, likewise, from the preceding table, that the people in Sweden engaged in agricultural pursuits bear to all the other inhabitants nearly the proportion of 7 to 5; while, in Great Britain, the proportion is nearly as 7 to $8\frac{1}{2}$. The agriculturists in Sweden amount to more than half the population: in Great Britain, to considerably less. Hence the reason of the very great proportion of the inhabitants of Sweden who live in the country. A proportion which exists no where else in Europe, except in Norway, and perhaps, also, in Russia.

If we consider the small and scattered population of Sweden, we must conclude that the revenues cannot be great; for a scattered population is always a proof of poverty and want of manufactures, which alone are capable of introducing riches into a country. What the present revenue of Sweden may amount to, it is difficult to say; for every thing was so terribly deranged by the Russian war, and the country was so much exhausted, that the revenue may have been injured. But if we consider the channels from which that revenue proceeds, we shall probably conclude, that it is pretty much the same

at present as it was in the time of Gustavus IV. Adolphus, before the Russian war broke out.

These revenues are chiefly drawn from the rents of the royal demesnes, part of the great tithes, a poll-tax (amounting to about 1*s.* 3*d.* from each person), duties on exports and imports, on mines and forges, on distilled spirits, a tax on chimnies, and some monopolies which the crown holds. Before the late revolution, it amounted to about 1,050,000*l.* a year, not reckoning the rents of lands assigned to soldiers and sailors, by means of which these classes of men are in a great measure supported; for it is obvious that 1,000,000*l.* would not be adequate to the support of the army which the Swedes keep constantly on foot. Indeed, the expenses of the Swedish government, like that of most others, have usually exceeded the income; and the deficiency has been made up by loans, and other similar expedients, well known in this, and probably in most other countries. A system obviously injurious to the real interests of the country which adopts it; but which, when once begun, can hardly be checked; because the great expenses incurred by any one ambitious potentate in Europe oblige all his neighbours to launch out into the same expenses, in their own defence.

The government of Sweden is an hereditary monarchy; but the power of the monarch is limited, and the Swedes enjoy a good deal of freedom. I gave a sketch of the Swedish constitution in a preceding chapter, and need not resume the subject here. It bears a certain resemblance to the British, though it is inferior to ours in several striking particulars. The Diet is in some respects analogous to our Parliament; but the King of Sweden is much more independent of the Diet, than the King of Great Britain is of his Parliament. There is nobody in the Diet equivalent to our House of Commons; for neither the peasants nor the burghers, nor indeed both together, have the same weight.* The greatest defect in the Diet is the want of a body of men equivalent to our country gentlemen. For in Sweden, as was mentioned in a former part of this work, the country gentlemen

cannot become members of the Diet, as they cannot be admitted into any of the four houses into which the Diet is divided.

Another palpable defect in the Swedish constitution is the indefinite multiplication of the nobility; the exemptions to which they are entitled; and the great power which they of course have acquired in the state. It is a very remarkable circumstance, and one which does not admit of a ready explanation, that Great Britain is the only country in Christian Europe, where the title of a nobleman descends only to his eldest son, to whom the privileges of nobility are likewise confined; while all the rest of the family, however numerous, descend into the rank of commoners, and mix with the great mass of the people. The consequence is, that the nobility in Great Britain can only increase in number by creations; and, in consequence of the want of descendants, titles are every now and then becoming extinct. Whereas, in Sweden, and, indeed, in every other country in Europe, all the descendants of a nobleman are noble, and enjoy all the privileges and exemptions of the father. Hence, the number of the nobility is always increasing with the increase of the population, and indeed at a much greater rate, in consequence of new creations. The nobility, therefore, are an increasing nuisance, which at last becomes intolerable. It was this grievance that contributed more than any other to the French revolution. It occasioned the north of Germany to be overrun with such facility by the French; for I conceive the class of nobility to have been a greater nuisance in the north of Germany, and to have held the common people under greater oppression, than in any other part of Europe. If the French put an end to that system of oppression exercised by the nobility, they have been of prodigious service to the north of Germany; which, after expelling their conquerors, may probably become more flourishing and powerful than they have yet been.

The Swedish nobility, and their domestics, are exempted from the poll-tax, and from several other burthens which fall upon the rest of the community. This is an iniquitous exemption, which ought to be

removed, for the sake of the nobility themselves; for it must make them objects of dislike to the rest of their countrymen, which may, in process of time, lead to their destruction, as it has done in other countries. But the influence of the nobility in the Diet is so great, and they are so blind to their own true interests, that there is little hope of seeing a measure, which would be of so much national benefit, and not in the least injurious to the nobility themselves, put in execution.

There is no country in Europe where the constitution has been changed more frequently than in Sweden. The last revolution was the third almost within the memory of the present generation. This instability I conceive to be chiefly owing to the great influence of the nobles. The king, when he happens to be a prince of abilities, finds no great difficulty in counteracting this influence, as he is sure to be supported by all the inferior ranks. But a weak prince, on the other hand, is easily got the better of by the nobility; who, in such cases, always recover their influence. Accordingly, we find, that all the changes which have taken place during the reign of a king of abilities, have been in favour of the extension of the royal authority; while those which have occurred during the reign, or at the accession of weak princes, have extended the influence of the Diet; that is, of the nobles.

Notwithstanding the great figure which the Swedes have made in war, and the numerous conquests which they have achieved, their forces were never very numerous. Indeed, during the early and most splendid part of their history, most of their officers were foreigners, and especially Scotsmen; who, from the miserable state of their own country, during the reign of the Stuarts, were more given to leave it, and seek their fortunes in other kingdoms, than the inhabitants of any other nation in Europe. The Irish have, for many years back, been actuated by a similar motive. In the time of Charles XI. which may perhaps be looked upon as the period when Sweden had reached the acmé of its greatness, the whole Swedish army amounted to 60,000, most of them militia, and scattered over a territory twice as large

as the present kingdom of Sweden. Gustavus Adolphus entered Germany, and began his career of conquest at the head of about 9000 men. It is true, his troops speedily increased in number, by the accession of German troops, and at last amounted to 100,000 men.

The number of Swedish troops is as great at present, perhaps, as it has been at any period of the Swedish history, except during the latter end of the reign of Gustavus IV. Adolphus. The regular Swedish army, at present, amounts to 50,000 men; and there is, besides, a supplementary army of 30,000 men, or rather boys, from which the deficiencies of the regular army are supplied. The men are raised by conscription, a method introduced at the late revolution, in imitation of the system followed by the French government. These soldiers may be viewed in the light of a kind of militia. They are raised so many in each province; and when they are not wanted in the field, they reside in the province where they are raised. The privates are furnished with houses and fields, by the cultivation of which they support themselves. The same method has been adopted for paying the officers. So that, except for clothing, the Swedish army is but a small expense to government. When they take the field, they require pay like all other military men; but as the Swedish finances are not adequate to support such a number of troops, it is obvious that they can never take the field, at least continue in it for any length of time, unless they are subsidized by some foreign state. In the late war, they received a subsidy of 1,200,000*l.* a year from Great Britain; but as this sum was not nearly adequate to discharge the expenses incurred, the Swedish finances were very speedily entirely deranged; and, at the revolution, they had no other means of supplying the immediate wants of government, than a voluntary loan. If the Swedes engage in the present war in Germany, as it is pretty obvious they will, they must be again subsidized by this country; otherwise it will be impossible for them to bring an army of any consequence into the field.

The Swedish military dress and tactics are quite the same as the French. I was much struck with the length of their bayonets. They

exceed, by several inches, the length of the bayonets of any other troops in Europe, and must be formidable weapons in the hands of resolute men.

Let us now consider the resources of Sweden, which may enable her to increase her population and her revenue, and thus to keep pace with the other nations of Europe. These resources may be reduced under three heads; namely, agriculture, manufactures, and trade. We will take a view of each of these heads, in the order in which we have mentioned them.

I. Several remarks on the agriculture of Sweden have been made in former parts of this work, defects have been pointed out, and ameliorations suggested; but, in considering agriculture as a national resource, we must go a little deeper. We must know the quantity of arable land in the country, the proportion of it under cultivation, the quantity of corn raised, and the supply which this furnishes for the yearly consumption of every individual in the country. All of these points are answered in the following table, drawn up for the year 1811. I conceive it to be one of the most curious agricultural documents ever furnished by any country. It would be very important and instructive to have a similar table drawn up for Great Britain; and the Board of Agriculture are the only persons capable of venturing upon such an undertaking. We recommend such a table to their consideration. It would at once lay open all the evils and defects which exist in any part of the kingdom, and suggest the proper remedies.

| Provinces. | Arable ground in tunnlands. | | | | | Arable land to the whole extent of country, as 1 to | Proportion of arable land cultivated. | Mean increase of corn in four years. | Grain sown in spanns. | | Produce from the seed in spanns. | | Amount of grain to each person, in tunns. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | In the towns. | In the country. | Total. | Amount to each farm. | Amount to each labourer. | | | | For each farm. | Total. | For each farm. | Total. | |
| Norrbotten ..... | 98 | 7982 | 8080 | 15·4 | 0·4 | 2151 | $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$ | 4·4 | 16 | 8500 | 70 | 37570 | 0·8 |
| Vesterbotten ..... | 80 | 10450 | 10530 | 15 | 0·4 | 1465 | | 4·4 | 18 | 12800 | 79 | 56576 | 1·2 |
| Vester Norrland .. | 212 | 22568 | 22780 | 14·6 | 0·6 | 220 | | 5·3 | 12 | 19347 | 63 | 103509 | 1·3 |
| Jämtland ..... | 20 | 10700 | 10720 | 11·2 | 0·5 | 917 | | 5·3 | 9 | 9036 | 48 | 48343 | 1·2 |
| Norrland .... | 410 | 51700 | 52110 | 14·2 | 0·5 | 915 | $\frac{3}{4}$ | 4·9 | 13 | 49683 | 64 | 245998 | 1·2 |
| City of Stockholm | 400 | ..... | 400 | .. | .. | .... | .. | .... | .. | ..... | .... | ..... | .. |
| Stockholm ..... | 516 | 70500 | 71016 | 18 | 1·2 | 22 | $\frac{1}{2}$ | 6·2 | 12 | 51127 | 74 | 316987 | 2·6 |
| Upsala ..... | 2070 | 82294 | 84364 | 23·7 | 1·7 | 13 | $\frac{1}{2}$ | 6·2 | 13 | 47257 | 81 | 285356 | 2·8 |
| Vesteros ..... | 2430 | 53085 | 55515 | 19·5 | 1·1 | 27 | $\frac{1}{3}$ | 5·7 | 12 | 36713 | 78 | 211100 | 2 |
| Nyköping ..... | 988 | 53023 | 54011 | 16·5 | 0·9 | 24 | $\frac{1}{3}$ | 6·7 | 10 | 33583 | 67 | 225006 | 1·9 |
| Örebro ..... | 2719 | 43504 | 46223 | 16·6 | 0·7 | 36 | $\frac{1}{3}$ | 5·2 | 13 | 37946 | 68 | 198279 | 1·5 |
| Carlstad ..... | 2050 | 80423 | 82473 | 58 | 0·9 | 42 | $\frac{2}{3}$ $\frac{3}{4}$ | 4·3 | 51 | 87794 | 219 | 377514 | 2·6 |
| Stora Kopparberg . | 599 | 50948 | 51547 | 28·6 | 0·6 | 129 | $\frac{2}{3}$ $\frac{3}{4}$ | 5·8 | 23 | 41514 | 133 | 240781 | 1·7 |
| Gefleborg ..... | 1895 | 26472 | 28367 | 13·6 | 0·5 | 140 | $\frac{2}{3}$ $\frac{3}{4}$ | 6·6 | 11 | 23157 | 73 | 153996 | 1·5 |
| Svealand .... | 13667 | 460249 | 473916 | 24·3 | 0·9 | 45 | $\frac{7}{8}$ | 5·6 | 16 | 359091 | 90 | 2009017 | 1·9 |
| Linköping ..... | 2948 | 101113 | 104061 | 19 | 1·1 | 21 | $\frac{1}{2}$ | 5·3 | 14 | 67933 | 74 | 360044 | 1·8 |
| Kalmare ..... | 411 | 65710 | 66121 | 19·7 | 0·8 | 34 | $\frac{2}{3}$ $\frac{3}{4}$ | 4·6 | 14 | 50123 | 64 | 230566 | 1·3 |
| Iönköping ..... | 503 | 53181 | 53684 | 13·7 | 0·7 | 40 | $\frac{3}{4}$ | 4·1 | 14 | 56228 | 57 | 233346 | 1·5 |
| Kronoberg ..... | 161 | 37534 | 37695 | 13·2 | 0·6 | 48 | 1 | 4·2 | 14 | 41745 | 59 | 175229 | 1·4 |
| Blekinge ..... | 300 | 21415 | 21715 | 20 | 0·6 | 27 | $\frac{3}{4}$ $\frac{4}{5}$ | 5·6 | 22 | 24847 | 123 | 139143 | 1·7 |
| Skaraborg ..... | 2200 | 140992 | 143192 | 29·8 | 1·6 | 12 | $\frac{3}{4}$ | 4· | 22 | 106466 | 88 | 425864 | 2·3 |
| Elfsborg ..... | 1034 | 72774 | 73808 | 17·5 | 0·7 | 37 | 1 | 3·8 | 20 | 87969 | 78 | 334282 | 1·6 |
| Göteborg ..... | 2184 | 40274 | 42458 | 15·2 | 0·6 | 22 | $\frac{4}{5}$ | 5·1 | 15 | 42140 | 76 | 215757 | 1·4 |
| Halmstad ..... | 1094 | 42889 | 43983 | 15 | 0·9 | 23 | 1 | 3·7 | 15 | 44592 | 55 | 167120 | 1·7 |
| Christianstad .... | 754 | 88590 | 89344 | 9·7 | 1·1 | 13 | $\frac{3}{4}$ | 4·3 | 23 | 71169 | 99 | 306027 | 1·9 |
| Malmohus ..... | 5287 | 217322 | 222609 | 54·9 | 2·3 | 4 | $\frac{2}{3}$ $\frac{3}{4}$ | 4·6 | 29 | 118687 | 133 | 548334 | 2·8 |
| Gottland ..... | 852 | 29212 | 30064 | 27·3 | 1·7 | 20 | $\frac{2}{3}$ $\frac{3}{4}$ | 4·5 | 18 | 19894 | 81 | 83523 | 1·9 |
| Götaland .... | 17728 | 911006 | 928734 | 23·5 | 1·1 | 20 | $\frac{4}{5}$ | 4·5 | 19 | 731794 | 85 | 3204184 | 1·9 |
| Sweden ..... | 31805 | 1422955 | 1454760 | 22 | 1·0 | 62 | $\frac{3}{4}$ | 5 | 17 | 1140567 | 85 | 5702835 | 1·8 |

N. B. The Swedish tunnland is rather greater than an English acre and a quarter.

The Swedish spann is a measure holding 28 kanns, or equal to 4¼ English wine pints; or something more than the 20th of a Winchester bushel.

The Swedish tunn is equal to two spanns, or 8½ English wine pints; or rather more than the 10th of a Winchester bushel.

Several very remarkable circumstances suggest themselves from the preceding table.

1. The arable land in Sweden amounts only to one 62d part of the surface: or, if we exclude Norrland, on account of its climate and

situation, to one 32d part of the surface. This is a very small proportion, indeed, and shows us how much the extension of agricultural pursuits must be limited in Sweden. In England, I should suppose that the arable portion of the surface considerably exceeds one half of the whole country; for it is needless to remark, that most of the commons are perfectly susceptible of cultivation.

2. The quantity of arable land actually under culture in Sweden, is represented in the table to amount to three fourths of the whole; so that one fourth of the arable land lies waste. This is a large proportion; though probably not greater than exists in any other country. But in Sweden, where the quantity of arable land is but small, it is more injurious to the country to neglect such a proportion, than in other countries, where the quantity of arable land is great. The whole arable land in Sweden amounts to.... 1,818,450 English acres.

Portion of ditto cultivated..... 1,363,838

Portion lying waste..... 454,612

3. From the great proportion of surface unfit for producing corn, it is obvious that Sweden is well adapted for a pastoral country, and ought to raise great herds of cattle and flocks of sheep. What number of these useful animals exists in Sweden, we shall see hereafter.

4. From the preceding table, it appears that the average size of a Swedish farm is 27½ English acres. This alone is a decisive proof of the miserable state of agriculture in that country. Nothing can be better established than the necessity of capital to the improvement of the soil, and to the raising of productive crops; and nothing can be clearer than that a man who farms twenty-seven acres must, of necessity, be destitute of capital, and therefore incapable of cultivating his farm in the way that it ought to be cultivated. The crops will not only be poor, but the land will fall daily into a worse state.

5. Nothing can furnish a more striking proof of the miserable state of agriculture, than the annual average of corn sown in each farm: it does not amount to a Winchester bushel. Such farmers cannot possibly depend upon the produce of their farm for their support; they must have other methods; and the principal of these, I presume,

is posting, which is carried on in Sweden to a great extent, and must bring in a considerable sum to all the peasants. The whole quantity of grain sown in Sweden amounts to little more than 57,028 Winchester bushels, or 7,128 quarters. The quantity obtained from this is about five times as great, or the return is about five to one.

6. But the most extraordinary circumstance which we learn from the table is, that the annual quantity of corn raised in Sweden amounts only to about one-fifth of a bushel for each individual, and this miserable pittance is the produce of an English acre and a quarter. I presume it would be difficult for any person in this country to form a conception of such a poor return. Nor would it be accurate to say that Sweden yields only the fifth of a bushel from the $1\frac{1}{4}$ acre. The fact is, that as they are unable to manure their lands, they are obliged to allow a great proportion of them to lie fallow. So that the quantity of land really under tillage is greatly below what is stated in the table. This, however, comes to the same thing with respect to the ultimate effect. So that in reality the cultivated lands of Sweden yield only the sixth part of a bushel per acre. We are surely considerably within bounds when we say, that a very moderate degree of skill would enable them to increase their produce 30 fold, and thus render them an exporting instead of an importing nation. For it is obvious that such a miserable pittance as the fifth part of a bushel can never be sufficient for an individual, how small soever the quantity of bread should be which he consumes in a year.

Let us now see the quantity of horses, black cattle, and sheep, which exist in Sweden, and how they are distributed over the country. These are obviously the grand instruments of agriculture, without which no real progress can be made. The following table will furnish us with very accurate ideas upon this important head.

| Provinces. | Animals in the towns. | | | | Ditto in the whole country. | | | | | Tunns sown for each pair of draught animals. | Per farm. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Horses. | Oxen. | Cows. | Sheep. | Horses. | Oxen. | Cows. | Young cattle. | Sheep. | | Horses. | Cattle. | Sheep. |
| Norrbotten | 67 | 10 | 680 | 60 | 4000 | 700 | 19400 | 3954 | 26300 | 4·2 | 6 | 45 | 49 |
| Vesterbotten | 50 | 20 | 200 | 20 | 5500 | 990 | 25500 | 6246 | 34700 | 4·2 | 7 | 46 | 49 |
| Vesternorrland | 52 | 2 | 513 | 150 | 15000 | 1138 | 39200 | 8300 | 48500 | 1·5 | 8 | 36 | 30 |
| Jamtland | 6 | .... | 20 | 16 | 8250 | 6193 | 22461 | 5086 | 32050 | 1·5 | 7 | 36 | 34 |
| Norrland | 175 | 32 | 1413 | 246 | 32750 | 13221 | 106561 | 23586 | 141550 | 2·8 | 7 | 39 | 40 |
| City of Stockholm | 1000 | .... | 1500 | 1436 | ..... | ..... | ..... | ..... | ..... | .... | .. | .. | .. |
| Stockholm | 166 | 34 | 488 | 209 | 19715 | 14653 | 35520 | 11011 | 49563 | 4·4 | 4 | 14 | 12 |
| Upsala | 448 | 15 | 643 | 245 | 21857 | 17768 | 28221 | 13996 | 49852 | 2·0 | 6 | 16 | 14 |
| Vesteros | 468 | 49 | 1576 | 704 | 14374 | 8162 | 28094 | 14952 | 31182 | 3·3 | 5 | 17 | 10 |
| Nykoping | 318 | 32 | 818 | 665 | 14688 | 13763 | 27687 | 16469 | 45014 | 2·7 | 4 | 17 | 13 |
| Örebro | 243 | 38 | 490 | 290 | 10229 | 10090 | 33804 | 13980 | 39546 | 3·7 | 4 | 20 | 14 |
| Carlstad | 190 | 20 | 630 | 74 | 13391 | 3712 | 45557 | 19692 | 74996 | 10·2 | 7 | 40 | 43 |
| Stora Kopparberg | 212 | 23 | 949 | 413 | 12585 | 865 | 41171 | 16859 | 54872 | 6 1 | 7 | 32 | 30 |
| Gefleborg | 207 | 8 | 1068 | 350 | 11830 | 832 | 45893 | 12550 | 44484 | 3·4 | 5 | 28 | 21 |
| Svealand | 3252 | 219 | 8162 | 3786 | 118669 | 59845 | 285947 | 118509 | 389509 | 4·2 | 5 | 21 | 19 |
| Linköping | 412 | 246 | 866 | 310 | 29991 | 15723 | 47268 | 19453 | 68909 | 3·0 | 5 | 15 | 12 |
| Kalmare | 171 | 60 | 371 | 223 | 22463 | 22459 | 48793 | 27945 | 84620 | 2·2 | 7 | 28 | 15 |
| Iönköping | 210 | 62 | 414 | 149 | 12583 | 18606 | 45413 | 31473 | 35916 | 3·0 | 3 | 24 | 9 |
| Kronoberg | 36 | 10 | 150 | 12 | 8773 | 14672 | 33375 | 28342 | 48991 | 3·6 | 3 | 27 | 17 |
| Blekinge | 175 | 8 | 150 | .... | 8085 | 6704 | 17705 | 12599 | 21550 | 3·3 | 7 | 34 | 19 |
| Skaraborg | 404 | 140 | 926 | 510 | 25428 | 25808 | 44369 | 32889 | 69567 | 4·1 | 5 | 21 | 14 |
| Elfsborg | 243 | 24 | 758 | 134 | 19746 | 15157 | 54409 | 29474 | 75330 | 5·0 | 4 | 23 | 17 |
| Göteborg | 265 | 16 | 761 | 58 | 17818 | 1968 | 32582 | 15717 | 59463 | 4·3 | 6 | 17 | 19 |
| Halmstad | 328 | 82 | 727 | 427 | 13902 | 4084 | 28245 | 19039 | 52655 | 4·9 | 4 | 17 | 18 |
| Christianstad | 220 | 14 | 443 | 123 | 32055 | 12894 | 30471 | 30222 | 60794 | 3·1 | 10 | 26 | 20 |
| Malmöhus | 1123 | 146 | 1354 | 895 | 49338 | 22280 | 32505 | 28350 | 78595 | 3·3 | 15 | 20 | 19 |
| Gottland | 210 | 27 | 430 | 160 | 12146 | 791 | 12076 | 9022 | 30803 | 3·0 | 10 | 20 | 30 |
| Götaland | 3797 | 835 | 7350 | 3001 | 252328 | 161156 | 422208 | 284525 | 682693 | 3·5 | 6 | 23 | 17 |
| Sweden | 7224 | 1086 | 16925 | 7033 | 403747 | 234222 | 814816 | 426710 | 1212752 | 3·5 | 6 | 25 | 20 |
| | | | | | | | | | | | | | |
| | | | | | | 1,475,748 | | | | | | | |

From the preceding table it appears that the whole number of horses, cattle, and sheep in Sweden, are as follows:

Horses ..... 403,747
Cattle ..... 1,475,748
Sheep ..... 1,212,752

This number must be admitted to be extremely small and quite inadequate to the purposes of agriculture. However, if we compare the size of the farms with the number of cattle belonging to each, we

shall be at first tempted to change our opinion. We have seen above that the average quantity of arable land belonging to a Swedish farm amounts to 27½ English acres. Now from the preceding table it appears that the average number of horses attached to each farm is six, of cattle twenty-five, and of sheep twenty. Six horses are more than sufficient for cultivating twenty-seven acres; while the quantity of manure produced by twenty-five cattle ought to go a considerable way towards manuring twenty-seven acres. But we should judge very erroneously, if we were to conclude that the arable land constituted the whole of the farm. Every farm has attached to it a quantity of forest ground, which may at an average amount to nearly 1000 acres. This space, which is covered with trees, is destined for the support of the cattle belonging to the farm. Here they feed the greatest part of the year; so that the manure which they form is in a great measure wasted upon that part of the farm which is not arable. In winter, when the cattle keep the house, they are so pinched for food that the manure which they produce is scanty, and of comparatively little value.

From the preceding statements respecting the state of farming in Sweden, which we have drawn from good authority, it must be obvious how small a resource agriculture is at present to the Swedish government compared to what it might be. The method of improving it is sufficiently obvious. Let the turnip husbandry be introduced to a considerable extent. Let part of the waste land be laid down in sown grasses to furnish a supply of hay. Let the number of cattle and sheep be at least tripled. Let a sufficient quantity of manure be thus collected. Finally, let the size of the farms be much increased; and let wheat in all places be substituted for rye. By such methods the agricultural produce might be increased at least thirty fold, which would not only be a source of great emolument to the country, but would speedily triple the present number of inhabitants. It were much to be wished that the Swedes would become so sensible to their true interests as to adopt these important and necessary improvements.

II. The manufactures of Sweden are not in a much better state than the agriculture; but they do not seem to be so susceptible of improve-

ment. The disposition of the Swedes does not appear to adapt them for a manufacturing nation. From every thing that I could perceive, they were rather given to indolence than otherwise. The young men at Stockholm complained of the distances between different parts of the town, and assigned the distance as a reason for not regularly returning visits. Every man of business in London walks at least ten times as much as the same class of people do in Sweden. There is another circumstance which appears much more incompatible with the successful prosecution of manufactures; the Swedes, instead of endeavouring to extend their manufactures, and improve their sales, are anxious only to secure the highest price possible, even though that price should limit or even diminish the extent of the sale. Wherever such a spirit exists we may be certain that manufactures are not in a flourishing state, that a sufficient number of rivalships do not exist in the same branches of manufacture to keep each other in check, and prevent them from attempting to realise immoderate profits.

The staple manufacture of Sweden is undoubtedly iron. This manufacture occupies the greatest number of hands, and is carried on to the greatest extent. In the last chapter I gave a table of the number of iron mines in Sweden, of the number of smelting houses and forges, and of the quantity of iron annually produced, either in bars or in coarse utensils. The mines amount to 176, the smelting houses amount to 624, the forges to 764, and the quantity of iron annually produced amounts to 431137 skeppunds, or 1,293,411 cwt., which amounts to 1693 cwt. for each forge, at an average in the course of a year. This shows us upon how small a scale each of these forges is conducted. Nevertheless the number of workmen employed, including the mines, must amount to many thousands, so that it is by far the most valuable manufacture that exists in Sweden. The iron which they make is unrivaled in point of excellence; but this staple of Sweden is in a state of decay, and we may predict without much hesitation, that when a general peace arrives, it will become still more limited than it is at present. For the English iron is produced at so much lower a price, and it answers so well for most purposes, that it must

in a great measure drive the Swedes out of the market of Europe, or oblige them to sell at so low a price that they can no longer manufacture with profit. Hence many of the small forges will be obliged to stop, and the manufacture will be confined to those forges, as Dannemora, which produce such excellent iron, that they may sell it any where, at their own price, without fear of rivalship. I was very much struck with one circumstance in travelling through Sweden, I mean the little use which they seem to make of cast iron, compared to this country. This is owing, I presume, to the extreme hardness of the Swedish cast iron in general, owing to the process which they follow in reducing their iron ores.

Copper is another metal raised in considerable quantity in Sweden, though to what amount I was not able to learn. There is reason to believe that it has diminished very materially within these thirty years, and that some of the greatest copper mines in Sweden, as Fahlun, are nearly exhausted. The quantity of copper exported annually from Sweden, about thirty years ago, was in value nearly 100,000*l.* The present distracted and unsettled state of Europe renders it difficult to say what is the present amount of that article, though I conceive it to be considerably below the value of that sum.

Timber, though it cannot with propriety be reckoned a manufacture, is however a very material and seemingly inexhaustible source of income. The value of the fir wood annually exported cannot be less than 100,000*l.* Indeed it is probably considerably greater than that sum.

Tar is an article which might be manufactured from the fir woods in the north of Sweden, almost to any amount. As these woods are at present of little or no value, and as they are left to decay on the ground, the institution of such a manufactory would be all clear gain. The quantity of tar made in Sweden, or at least exported from it, is considerable; but by no means so great as it ought to be, or as it might easily be made.

All the other manufactures in Sweden are so inconsiderable as scarcely to deserve mention. Alum and copperas are exported to the

ports on the Baltic. There are brass and iron works for the internal consumption of the kingdom, a very coarse pottery, glass works, coarse woollen manufactories, some sugar refineries, some snuff and tobacco works, and a few others of no great consequence in a commercial point of view, though useful and indeed essential to the country.

Thus none of the Swedish manufactures are of much consequence except their iron; none of them seem to be on the increase; nor is there any prospect at present of Sweden becoming a commercial nation. Were she to become an integral part of the Russian empire, she might have a chance of becoming a commercial nation; but situated as she is, with so small a population and such few resources, manufacturing, at least to any extent, seems to be out of the question. Indeed manufactures seem to be inconsistent with the necessary habits of a thinly peopled nation; nor am I aware of any nation in such circumstances becoming eminent for its manufactures.

III. The trade of Sweden was so much deranged by her quarrel with Russia and Denmark, and afterwards with Great Britain, that it is difficult to form any correct estimate of it at present. During the summer of 1812 Gottenburg was the great depot of British goods, and Sweden the great thoroughfare between Great Britain and Russia. The Gottenburg merchants have been greatly enriched by this state of things, but how far it has redounded to the benefit of Sweden in general, I had no means of determining.

At all times Sweden has been under the necessity of importing a much greater amount of articles than she exported. The only articles of export are, iron, copper, wood, and a few subordinate articles of no great amount. Those of import are salt, wine, corn, sugar, tea, coffee, spices, &c. Formerly herrings were salted at Gottenburg, and exported to a considerable amount; but that source of emolument has failed entirely of late years by the herrings leaving the coast. In the year 1782 the value of the goods exported from Sweden to England was 56,083 *l.*, the value of the goods imported from England was

163,219*l.* I have no doubt, that at present, the amount both of the exports and imports to this country will be much greater, because Great Britain is almost the only market to which Sweden can have recourse. In 1782 the Swedish trade with Holland, with France, and with Prussia was considerable. At present the trade with all these powers is reduced almost to nothing.

There are several circumstances connected with the Swedish trade, which I cannot help contemplating as abuses that ought to be remedied. I shall mention one or two of these by way of specimen. There are a great many articles of the first importance, as porcelain, broad cloth, cottons, &c. which the inhabitants of Sweden cannot dispense with, that are prohibited from being brought into the country. This prohibition does not prevent the importation of these articles, and government must be aware that it does not. For every where you meet with porcelain vessels, of English or French manufacture; all the genteel people are dressed in British broad cloth; and cotton of all kinds (obviously British manufacture) is just as common in Sweden as in England. Nothing then is gained by such a prohibition; unless the disagreeable situation into which the importer is brought, and the necessity he is under of bribing the custom-house officers, be considered as an advantage. The effect of such prohibitions is merely to put into the pockets of the custom-house officers a considerable part of the money, which might have been drawn as revenue, had government been wise enough to permit the importation of such articles, upon paying a proper duty. Were such prohibitions intended to encourage Swedish manufactures, something might be said in their favour; but no such manufactures exist, and it is well known to every Swede that such articles cannot be dispensed with. This abuse I allow is not carried to so great a height in Sweden as in Russia, where the custom-house officers are literally supported by the bribes which they receive, in order to allow prohibited articles to land, and where the Emperor is so well aware of the circumstance, that he is in the habit of purchasing these very prohibited articles from the Russian merchants. No policy

can be conceived more miserable than this, more prejudicial to the interests of the country, or more injurious to morality and virtue.

There is another abuse of a different nature, but equally prejudicial to the interests of Sweden. Gustavus III. created an East India Company, and gave them the exclusive privilege of importing East India commodities into Sweden. This company is fixed at Gottenburg; they have no vessels that go to the East Indies, as was no doubt the intention of Gustavus that they should, but they alone are the purchasers of all the East India commodities that are brought into Sweden by foreigners; and before the present war between Britain and America, they were abundantly supplied with such articles by the Americans, and the East India Company afterwards retailed those articles to the Swedes at their own price. The only effect of such a monopoly is to oblige the Swedes to pay a high price for articles of indispensable necessity, which they might have had at a cheaper rate, and thus to enrich a few individuals at the expense of the nation at large.

From the preceding review of the resources of Sweden, it appears that Agriculture is the chief means of increasing the wealth and population of the country. This source of wealth and population which is very little connected with foreign circumstances, has been unaccountably neglected. It is devoutely to be wished that the inhabitants of Sweden would give an attentive consideration to the importance of improving the state of their agriculture, and that they would immediately set about opening that golden mine, which promises to be so productive.

Situated as Sweden is at present, she can never hope to rise to the rank of a European power of the first magnitude. She is surrounded by two nations, with whom she has been at war for two centuries; against whom of course she has contracted an indelible hatred. These nations are Russia and Denmark. The former of them is such a prodigious over-match for Sweden, both in extent of territory and number of inhabitants, that she can never hope to wage with her more than a defensive war, and is utterly unable to wrest from her any of those ancient territories which once belonged to the Swedish crown. But

as far as defensive war is concerned, she is now much more invulnerable than at any former period. Separated on all sides from Russia by the sea, or by frozen regions, through which it is scarcely possible to march, she has only to keep up a respectable naval force to bid defiance to all the efforts of that mighty empire. Her naval force was nearly annihilated during the late Russian war; but she ought immediately to restore it to its former footing, and, as a farther security, cultivate the friendship of that power which is best able to protect her, by having the command of the sea.

In consequence chiefly of the intimate connection which subsisted for so long a period between Great Britain and Russia and Denmark, Sweden threw herself into the arms of France, and formed herself upon the model of that empire. Her nobles were educated in France, and French manners were universally prevalent among the higher ranks. These prepossessions have left their natural effects behind them, and, notwithstanding the great change in the state of Europe, and the new interests which ought to direct the friendships of Sweden, her people still retain their old partiality to France, and secretly rejoice at the successes of Bonaparte, and mourn over his disasters.

There can be no doubt that in the present crisis of Europe, the real interest of Sweden is to prevent the French from obtaining any permanent footing in Poland or Germany; to preserve the freedom of the Baltic, with which their own independence is essentially connected; for it is too obvious to require any proof, that, if Bonaparte had succeeded in his designs against Russia; if he had forced her to shut her ports against Great Britain; or if he had driven her altogether from the borders of the Baltic, in such a case Sweden would have fallen entirely under the power of the French Emperor, and would have been as completely subject to him as any province in France. The Swedes themselves, blinded by their hatred to Russia, would not admit any such consequence, and maintained to me, that even in such a state of things, they could maintain their independence just as well as Great Britain. They did not attend to the prodigious difference between the two nations. The resources of Great Britain are greater

than those of all the rest of Europe united, because the trade and manufactures of all Europe are at present centered in her. She is mistress of the sea, and from the very nature of things must continue so during the whole period of the war with France, how long soever that war should last. Had Bonaparte succeeded in his plan of shutting British commerce from all the harbours of Europe, he would have embarrassed Great Britain for a time; but the enterprise of our merchants would have gradually opened new channels of commerce, and the manufactures of Great Britain would have made their way into the continent, from the most distant shores of Asia. The consequence would have been the impoverishing of the whole continent, and the deterioration of all its states in point of civilization. But it would not have produced the ruin of Great Britain. Sweden, on the other hand, is a small state, without population, revenue, or resources, and dependant upon the surrounding nations even for corn. She could not have resisted the power of Bonaparte for even a single campaign, and would certainly have yielded to all his commands without any struggle whatever.

The interest, therefore, of Sweden was evidently to prevent any such crisis from occurring, as far as was in her power. But at the commencement of the present war between France and Russia, the situation of the Crown Prince was very delicate. It was impossible to foresee who would ultimately gain the victory. Indeed previous experiment rather inclined one to augur in favour of Bonaparte, though the Crown Prince, who knew the extent of the Russian preparations, and the line of conduct they intended to pursue, would probably consider the chances of success as pretty evenly balanced. Had he declared in favour of France in such a situation of things, he would not only have acted against the real interests of Sweden, but would have exposed himself and his kingdom, in case Russia proved successful, or was even able to preserve her own country, to the resentment of Russia and Great Britain, two powers which Sweden could not withstand for a single month. On the other hand, if he declared in favour of Russia, on the supposition that Bonaparte should prove ultimately

successful, he exposed himself to the implacable resentment of that personage, who had formerly been his master, and which would have infallibly ended in his destruction.

His conduct in this delicate situation was dictated entirely by prudence. He amused both parties without declaring for either, and probably both parties were secretly in expectation that he would ultimately declare in his own favour. Bonaparte's disastrous campaign terminated in the destruction of his immense army, and obliged him to transfer the field of dispute from the banks of the Dwina to those of the Elbe; and instead of overrunning and destroying Russia as he had predicted, he was under the necessity of exerting all his energy in order to preserve if possible his influence over Germany. The confederation of the Rhine fell to pieces; the Emperor of Austria assumed a tone of independence, and the King of Prussia, from an ally and a subject, became an implacable and active enemy. In this situation of affairs, the Crown Prince of Sweden chose his side, declared himself in favour of the views of Great Britain and Russia, and hostile to those of France. Such a declaration from a man of Bernadotte's consummate prudence and great abilities ought to have considerable effect upon our opinions of the result of the next campaign. It indicates that, in his opinion, Bonaparte cannot again recover his influence in Germany, nor threaten the freedom of the Baltic.

The Crown Prince of Sweden has an opportunity at present of making a figure not inferior to that of Gustavus Adolphus, a situation in which it has been the lot of few men to be placed. By taking an active part in the next campaign, he may contribute essentially to drive the French beyond the Rhine, and thus not only cover his adopted country with glory, but secure the liberty of Europe, and put an end to the dreadful evils which have flowed from Bonaparte's unprincipled ambition. Compared with such objects the conquest of Norway or of Zealand, even if they could be achieved, and both are beyond the power of the Swedish monarchy, sink into insignificance. The population of the north of Germany

want only a leader of abilities to free their country. Let the Crown Prince of Sweden offer himself as that leader, and men and money will flow to him in abundance. The success of the struggle would be infallible, and he would become one of the most glorious characters in history.

# APPENDIX.

THE following table, copied from the Memoirs of the Swedish Academy of Sciences for 1809, was drawn up by Mr. Nicander. It exhibits a very complete view of the population and professions of Sweden before the separation of Finland.

## ARTICLE I.

### § I. *Class of Teachers.*

| | Number. |
|---|---|
| Priests | 3983 |
| Teachers | 606 |
| Exercise masters, *(öfnings-mästare)* | 78 |
| Scholars | 4619 |
| Church officers | 4598 |
| Total | 13884 |

### § II. *Civil Class.*

| | |
|---|---|
| Civil offices, great and small | 5322 |
| Physicians | 103 |
| Surgeons | 276 |
| Architects | 9 |
| Crown officers | 1329 |
| Custom-house officers | 1393 |
| Mine officers | 143 |
| Police officers | 268 |
| Forest officers | 407 |
| Sluice, bridge, and ferry boat officers | 294 |
| Officers for shipwrecks | 436 |
| Guards | 1037 |
| Total | 11097 |

§ III. *War Department.*

| | Number. |
|---|---|
| Officers | 2307 |
| Subordinate officers | 2413 |
| Soldiers and sailors | 48830 |
| Ship carpenters | 1525 |
| Musicians and drummers | 1025 |
| Waggoners and servants | 506 |
| Town guards | 398 |
| Watchmen | 784 |
| Total | 57788 |

§ IV. *Merchants.*

| | Masters. | Clerks, &c. | |
|---|---|---|---|
| | | Men. | Women. |
| Wholesale dealers | 318 | 398 | |
| Brokers *(Mäklare)* | 25 | 34 | |
| Ship factors | 33 | 10 | |
| Booksellers | 37 | 18 | |
| Upholsterers | 8 | 2 | |
| Jewellers | 48 | 7 | 6 |
| Retailers | 2394 | 2288 | 28 |
| Coffee boilers | 27 | 1 | 6 |
| Tavern keepers | 41 | 24 | 2 |
| Eating-house keepers | 399 | 31 | 19 |
| Keepers of posting-houses | 1051 | 21 | 41 |
| Total | 4385 | 2834 | 102 |

§ V. *Seamen.*

| | |
|---|---|
| Skippers | 1742 |
| Sailors | 8588 |
| Pilots | 950 |
| Light-house keepers | 33 |
| Total | 11313 |

§ VI. *Peasants.*

| | |
|---|---|
| Peasants in their own farms | 203243 |
| Peasants on the farms of others | 59265 |
| Cottars | 87807 |
| Colonists | 4266 |
| Insulated cottagers | 35219 |
| Villagers without land | 27076 |
| Fishers | 5578 |
| Other peasants not connected with agriculture | 47185 |
| Servants to the peasants | 305912 |
| Boys | 35214 |
| Total | 817645 |

§ VII. *Officers of Gentlemen.*

| | Number. |
|---|---|
| Inspectors and bailiffs | 1312 |
| Chamberlains | 180 |
| Gardeners | 1036 |
| Gardeners boys | 1134 |
| Footmen | 2219 |
| Huntsmen | 109 |
| Meadow and forest keepers | 622 |
| Coachmen | 689 |
| Fishers | 669 |
| Valets de cour | 22989 |
| Servant boys | 4260 |
| Cooks | 7 |
| Total | 35226 |

§ VIII. *Artists and Handicraftsmen.*

| | Masters. | Journeymen. |
|---|---|---|
| Architects | 118 | 43 |
| Masons | 266 | 181 |
| Painters | 34 | 15 |
| Organ builders | 3 | 2 |
| Saddlers | 87 | 36 |
| Shoe-makers | 2994 | 2074 |
| Tailors | 3829 | 2731 |
| Smiths | 1916 | 532 |
| Joiners | 416 | 120 |
| Stone-cutters | 39 | 5 |
| Chair-makers | 4 | .... |
| Turners | 55 | 11 |
| Coopers | 70 | 45 |
| Watch-makers | 25 | 12 |
| Cart-makers | 32 | 10 |
| Total | 9888 | 5817 |

§ IX. *Persons free from service and Proprietors.*

| | | |
|---|---|---|
| Persons of that description from § | I. Teachers | 279 |
| | § II. Civil class | 1647 |
| | § III. War department | 15125 |
| | § IV. Merchants | 367 |
| | § V. Seamen | 644 |
| | § VII. Officers of gentlemen | 438 |
| | § VIII. Handicraftsmen in the country | 1030 |
| | § IX. Manufacturers | 666 |
| | § XI. Handicraftsmen in town | 356 |
| Proprietors of estates | | 333 |
| Townsmen settled in the country | | 277 |
| Inhabitants of market towns | | 275 |
| Villagers not referrible to another § | | 1905 |
| Citizens not burghers | | 2305 |
| Burghers not referrible to another § | | 1892 |
| Workmen in the towns | | 6922 |
| Total | | 34463 |

## § X. *Trades, Manufactures, &c.*

| | Proprietors. | Factors. | Masters. | Assistants. | Boys. | Workers. Men. | Workers. Women. | Servants in shops. Men. | Servants in shops. Women. |
|---|---|---|---|---|---|---|---|---|---|
| Apothecaries | 89 | 2 | 21 | 100 | 86 | 5 | .... | 3 | .... |
| Manufactures. Alum | 4 | 13 | 22 | 8 | 4 | 371 | 185 | .... | .... |
| Pitch | .... | .... | 8 | 3 | .... | 25 | .... | .... | 1 |
| Glass | 8 | 26 | 86 | 46 | 68 | 202 | 11 | .... | .... |
| Iron | 44 | 134 | 585 | 383 | 731 | 797 | 25 | .... | .... |
| Copper forges | 3 | 7 | 35 | 17 | 8 | 108 | 1 | .... | .... |
| Copper founderies | 47 | 10 | 16 | 6 | 6 | 720 | 1 | .... | .... |
| Gunpowder | 1 | 7 | 2 | .... | .... | 45 | 4 | .... | .... |
| Iron smelters | 241 | 84 | 135 | 64 | 32 | 1283 | 187 | .... | .... |
| Brass | 3 | 12 | 32 | 3 | 30 | 157 | .... | .... | .... |
| Paper | 18 | 8 | 47 | 202 | 126 | 122 | 31 | .... | .... |
| Pipes | 5 | .... | 1 | 20 | 3 | 18 | 1 | 1 | .... |
| Stone ware | 1 | 4 | 2 | 11 | 15 | 29 | 5 | .... | .... |
| Hair powder and starch | 2 | .... | 1 | .... | .... | 20 | .... | .... | .... |
| Silver, gold, lead forges | .... | 1 | 1 | .... | .... | 141 | .... | .... | .... |
| Sugar | 78 | 17 | 19 | 11 | 4 | 199 | 5 | 11 | 1 |
| Nails | .... | .... | 5 | 4 | 7 | 1 | .... | .... | .... |
| Steel | 1 | 4 | 26 | 19 | 14 | 13 | .... | .... | .... |
| Iron bars | 146 | 574 | 991 | 1221 | 903 | 2276 | 130 | .... | .... |
| Sulphur, vitriol, Venetian red | 3 | 2 | 1 | .... | .... | 26 | 6 | .... | .... |
| Soap | 6 | 2 | 7 | 2 | 1 | 71 | 56 | .... | .... |
| Brick | 19 | 5 | 91 | 18 | 12 | 702 | 82 | .... | .... |
| Bake-houses | 28 | 11 | 27 | 1 | 1 | 428 | 6 | 1 | .... |
| Calcining work | .... | .... | 1 | .... | .... | 4 | 1 | .... | .... |
| Fabrics. Cords | 17 | .... | 3 | 27 | 11 | 11 | 95 | 1 | .... |
| White lead | .... | 1 | .... | .... | 2 | 7 | .... | .... | .... |
| Sail cloth | .... | 5 | 12 | 88 | 23 | 219 | 38 | .... | .... |
| Crucibles and fine clay pots | .... | .... | 8 | 6 | .... | 4 | .... | .... | .... |
| Cloth | 69 | 14 | 39 | 246 | 179 | 288 | 678 | 1 | .... |
| Cards | 5 | 1 | 2 | 7 | .... | 19 | 6 | .... | .... |
| Sealing-wax | 3 | .... | 1 | 2 | 1 | 2 | 1 | .... | .... |
| Linen and cotton | 11 | 45 | 15 | 59 | 17 | 10 | 18 | .... | .... |
| Needles and pins | .... | 2 | 2 | .... | .... | 42 | 27 | .... | .... |
| Worsted stuff | 1 | .... | 1 | 8 | 2 | 2 | 13 | .... | .... |
| Worsted stockings | .... | 1 | 8 | 31 | 12 | 1 | 1 | .... | .... |
| Morocco leather | 1 | 1 | .... | .... | .... | 4 | 11 | 1 | .... |
| Silk | 47 | 1 | 23 | 263 | 90 | 28 | 366 | .... | .... |
| Silk stockings | 18 | .... | 2 | 97 | 40 | 16 | 35 | .... | .... |
| Looking-glasses | 7 | .... | 8 | 12 | 9 | 2 | .... | .... | .... |
| Tobacco | 28 | 8 | 27 | 55 | 160 | 346 | 9 | 2 | .... |
| Woollen stuff | 11 | 1 | 5 | 54 | 10 | 11 | 2 | .... | .... |
| Woollen stockings | 1 | .... | 14 | 26 | 24 | 6 | 63 | .... | .... |
| Tanneries | 7 | .... | 13 | 23 | 6 | 7 | 3 | .... | .... |
| Fabric of arms | .... | 2 | 226 | 25 | 81 | 75 | .... | .... | .... |
| Founderies | 2 | 15 | 16 | 19 | 2 | 89 | .... | .... | .... |
| Mines of gold | .... | .... | 1 | .... | .... | 43 | .... | .... | .... |

| | Proprietors. | Factors. | Masters. | Assistants. | Boys. | Workers. | | Servants in shops. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Men. | Women. | Men. | Women. |
| Mines of copper | 3 | 5 | 2 | .... | 36 | 842 | 9 | .... | .... |
| iron | 68 | 17 | 13 | 1 | 20 | 1647 | 293 | .... | .... |
| marble | 1 | .... | .... | 7 | .... | .... | .... | .... | .... |
| silver and lead | 1 | .... | .... | .... | .... | 34 | .... | .... | .... |
| coal | .... | 5 | .... | .... | 20 | 133 | .... | .... | .... |
| Lime-pits and kilns | 28 | 7 | .... | .... | 112 | 109 | 7 | .... | .... |
| Lamp-black | .... | .... | .... | .... | .... | 1 | 1 | .... | .... |
| Charcoal | .... | .... | 8 | .... | 3 | 2304 | 135 | .... | .... |
| Linseed-oil | 1 | .... | 1 | .... | 3 | .... | .... | .... | .... |
| Salmon-fishing | .... | 1 | .... | .... | .... | 13 | .... | .... | .... |
| Mechanical workshops | 2 | 1 | 1 | 6 | .... | 23 | .... | .... | .... |
| Oil-mills | .... | .... | 2 | 1 | .... | 5 | .... | .... | .... |
| Potash | 2 | .... | 2 | .... | .... | 14 | .... | .... | .... |
| Mills | 393 | 75 | 681 | 127 | 68 | 2155 | 115 | .... | .... |
| Saltpetre-works | 9 | .... | 53 | 13 | 9 | 76 | 1 | 4 | .... |
| Nitric acid | .... | 1 | 2 | 1 | .... | 3 | .... | .... | .... |
| Herring-fishery | 11 | 95 | .... | 96 | .... | 35 | .... | .... | .... |
| Wood-yards | .... | 1 | .... | .... | .... | 24 | .... | .... | .... |
| Grindstones | .... | .... | 3 | 3 | 5 | 50 | .... | .... | .... |
| Wire-works | 1 | 2 | 7 | 1 | 17 | 32 | 309 | .... | .... |
| Stone-quarries | .... | .... | .... | .... | .... | 48 | 28 | .... | .... |
| Saw-mills *(sogvärk)* | 77 | 56 | 134 | 8 | 21 | 1112 | 24 | .... | .... |
| Tar-works | 10 | 1 | 5 | .... | .... | 18 | .... | .... | .... |
| Whale-oil | 5 | 83 | 1 | 13 | .... | 37 | 6 | .... | .... |
| Printers of books | 25 | 3 | 12 | 140 | 47 | 5 | 1 | .... | .... |
| calico | 12 | 3 | 16 | 78 | 49 | 49 | 12 | .... | .... |
| Wall and ditch-work | .... | .... | .... | .... | 3 | .... | .... | .... | .... |
| Fullers | 6 | .... | 13 | 3 | 3 | 25 | 3 | .... | .... |
| Total | 1572 | 1376 | 3544 | 3679 | 3136 | 17799 | 3047 | 25 | 2 |

## § XI. *Artists and Tradesmen in the Towns.*

| | Masters. | Assistants. | Boys. | Journeymen. | Servants in shops. | |
|---|---|---|---|---|---|---|
| | | | | | Men. | Women. |
| Bakers | 324 | 226 | 271 | 74 | .... | 88 |
| Barbers | 12 | 8 | 9 | .... | .... | .... |
| Curriers | 8 | 7 | 5 | 5 | .... | .... |
| Statuaries | 27 | 23 | 2 | .... | .... | .... |
| Pulley-makers | 19 | 7 | 17 | .... | .... | .... |
| Ink-makers | 50 | 29 | 36 | .... | .... | .... |
| Bookbinders | 157 | 103 | 111 | .... | .... | .... |
| Brush-makers | 10 | 4 | 8 | .... | .... | .... |
| Brewers | 159 | 31 | 13 | 394 | 3 | .... |
| Furriers | 62 | 36 | 42 | .... | .... | .... |
| Architects | 84 | 165 | 74 | 234 | .... | .... |
| Cordiners | 130 | 90 | 97 | 7 | .... | .... |

| | Masters. | Assistants. | Boys. | Journeymen. | Servants in Shops. | |
|---|---|---|---|---|---|---|
| | | | | | Men. | Women. |
| Chocolate-makers | 1 | .... | .... | .... | .... | .... |
| Carvers | 5 | 4 | 2 | .... | .... | .... |
| Brick and crucible makers | 1 | 5 | 4 | .... | .... | .... |
| Distillers | 3 | .... | .... | .... | .... | .... |
| Enamellers | 2 | .... | .... | .... | .... | .... |
| File-makers | 3 | 4 | 5 | 1 | .... | .... |
| Felters | 1 | .... | 1 | .... | .... | .... |
| Fishers | 1091 | 3 | 72 | 105 | .... | .... |
| Fishmongers | 44 | .... | 29 | 92 | .... | 1 |
| Wood block-cutters | 4 | 3 | .... | .... | .... | .... |
| Case *(fotral)* makers | 6 | 4 | 4 | .... | .... | .... |
| Dyers | 219 | 163 | 160 | 49 | 1 | .... |
| Gilders | 17 | 10 | 13 | .... | .... | .... |
| Tanners | 331 | 268 | 227 | 79 | 6 | 2 |
| Founders | 52 | 20 | 57 | .... | .... | .... |
| Plaster figure-makers | 2 | .... | .... | .... | .... | .... |
| Glass-dealers | 178 | 58 | 83 | 2 | .... | .... |
| Glaziers | 2 | 1 | 13 | .... | .... | .... |
| Engravers | 17 | 3 | 3 | .... | .... | .... |
| Gold wire-drawers | 6 | 10 | 7 | .... | 1 | .... |
| Goldbeaters | 4 | 2 | 6 | .... | .... | .... |
| Goldsmiths | 281 | 266 | 265 | .... | 1 | .... |
| Belt-makers | 125 | 71 | 102 | .... | .... | .... |
| Lead shot-makers | 2 | 1 | .... | .... | .... | .... |
| Thread-makers | 210 | 134 | 135 | .... | .... | .... |
| Hat-makers | 371 | 224 | 276 | 5 | .... | 1 |
| Horse-shoers | 204 | 146 | 240 | 6 | .... | .... |
| Coach-hirers | 17 | .... | .... | 80 | .... | .... |
| Instrument-makers | 34 | 25 | 22 | .... | .... | .... |
| Jewellers | 39 | 34 | 41 | .... | .... | .... |
| Comb-makers | 25 | 24 | 20 | .... | .... | .... |
| Card-makers | 12 | 5 | 6 | 2 | .... | .... |
| Cutlers | 239 | 130 | 214 | 5 | .... | .... |
| Bell-founders | 13 | 9 | 6 | 1 | .... | .... |
| Button-makers | 48 | 15 | 22 | .... | .... | .... |
| Knife-makers | 3 | 3 | 2 | .... | .... | .... |
| Braziers | 288 | 206 | 196 | 2 | .... | .... |
| Copper-plate-printers | 1 | .... | 2 | .... | .... | .... |
| Cork-cutters | 3 | 1 | 5 | 2 | .... | .... |
| Bottle-brush-makers | 1 | .... | .... | .... | .... | .... |
| Potters | 249 | 210 | 179 | 3 | .... | .... |
| Japanners | 2 | 2 | 4 | .... | .... | .... |
| Linen-makers | 95 | 42 | 20 | .... | .... | .... |
| Mechanists | 4 | 5 | 3 | 2 | .... | .... |
| Engravers of medals | 3 | .... | 1 | .... | .... | .... |
| Masons | 165 | 452 | 270 | 213 | .... | .... |
| Brass-workers | 28 | 26 | 23 | .... | .... | .... |
| Painters | 229 | 128 | 176 | 1 | .... | .... |
| Upholsterers | 3 | 1 | 2 | .... | .... | .... |

| | Masters. | Assistants. | Boys. | Journey-men. | Servants in shops. | |
|---|---|---|---|---|---|---|
| | | | | | Men. | Women. |
| Pin-makers | 48 | 16 | 55 | 3 | .... | .... |
| Organ-builders | 3 | 4 | 1 | .... | .... | .... |
| Umbrella-makers | 3 | .... | .... | .... | .... | .... |
| Quill-preparers | 2 | 2 | .... | .... | .... | .... |
| Hairdressers | 104 | 53 | 28 | .... | .... | .... |
| Pistol-makers | 26 | 14 | 15 | 1 | .... | .... |
| Planters and gardners | 115 | 6 | 24 | 54 | .... | .... |
| Metal-rollers | 34 | 27 | 32 | .... | .... | .... |
| Pump-makers | 7 | 1 | .... | 1 | .... | .... |
| Card-makers | 107 | 101 | 101 | 5 | .... | .... |
| Saddlers | 247 | 130 | 186 | 2 | .... | .... |
| Veil-makers | 30 | 11 | 8 | 1 | .... | .... |
| Cordiners | 13 | 15 | 23 | .... | .... | 1 |
| Seirce-makers | 1 | 1 | .... | .... | .... | .... |
| Ivory-turners | 16 | 12 | 12 | .... | .... | .... |
| Coblers | 110 | 24 | 16 | 4 | .... | .... |
| Shoemakers | 1055 | 955 | 859 | 8 | .... | 12 |
| Chimney-sweeps | 61 | 18 | 54 | 3 | .... | .... |
| Taylors | 798 | 643 | 534 | 13 | .... | .... |
| Tool-grinders | 9 | .. . | 1 | 1 | .... | .... |
| Butchers | 151 | 52 | 54 | 147 | 1 | .... |
| Joiners | 419 | 359 | 364 | 11 | .... | .... |
| Lace-makers | 26 | 20 | 16 | .... | .... | .... |
| Confectioners | 51 | 24 | 25 | 1 | .... | 5 |
| Fan-makers | 3 | 2 | .... | 1 | .... | .... |
| Spur-makers | 7 | 3 | 8 | .... | .... | .... |
| Syringe-makers | 11 | .... | .... | 60 | .... | .... |
| Stone-cutters | 15 | 23 | 4 | 21 | .... | .... |
| Chair-makers | 24 | 22 | 31 | 2 | .... | .... |
| Type-makers | 1 | 2 | 4 | .... | .... | .... |
| Steel-workers | 5 | 2 | 2 | 12 | .... | .... |
| Turners | 176 | 78 | 117 | 5 | .... | .... |
| Sword-makers | 11 | 6 | 3 | .... | .... | .... |
| White leather-dressers | 200 | 99 | 83 | 6 | .... | .... |
| Tapestry-makers | 17 | 11 | 13 | .... | .... | .... |
| Tinsmiths | 68 | 36 | 31 | 1 | .... | .... |
| Carpenters | 466 | 295 | 208 | 425 | .... | .... |
| Coopers | 160 | 96 | 107 | 3 | .... | .... |
| Watch-spring-makers | 1 | 1 | .... | .... | .... | .... |
| Clock-case-makers | 1 | 1 | 1 | .... | .... | .... |
| Watch-makers | 159 | 94 | 41 | .... | .... | .... |
| Silk-weavers *(Vadd makare)* | 6 | .... | 1 | .... | .... | .... |
| Cart-makers | 138 | 88 | 116 | 3 | .... | .... |
| Wax-workers | 2 | .... | .... | .... | .... | .... |
| Oiled-cloth-makers | 4 | .... | 1 | .... | .... | .... |
| Platers | 1 | .... | 2 | .... | .... | .... |
| Waggoners | 485 | .... | 5 | 93 | .... | .... |
| Edge-tool-makers | 17 | 10 | 20 | 6 | .... | .... |
| Cloth-shearers | 27 | 54 | 40 | 4 | .... | .... |
| Totals | 11164 | 6858 | 6847 | 2261 | 12 | 112 |

## § XII. *Married Women, Widows, and Children.*

| | Wives and widows. | Children. | |
|---|---|---|---|
| | | Boys. | Girls. |
| Married women in § I. | 7754 | 6007 | 6607 |
| § II. | 7189 | 6002 | 6959 |
| § III. | 42685 | 41096 | 41259 |
| § IV. | 2701 | 2072 | 2810 |
| § V. | 6376 | 5049 | 5617 |
| § VI. | 453558 | 389413 | 378304 |
| § VII. | 7854 | 5602 | 6084 |
| § VIII. | 8627 | 6916 | 7032 |
| § IX. | 8699 | 4667 | 6259 |
| § X. | 19878 | 16440 | 16973 |
| § XI. | 11518 | 8104 | 9243 |
| Women that follow a trade different from their husbands | 1360 | 390 | 485 |
| Married women that live alone | 4741 | 2793 | 2767 |
| Married women in § XIV. and § XV. | 9014 | 3516 | 3914 |
| Widows in §§ IV., X., XI., who pursue the profession of their husbands | 2044 | 705 | 1206 |
| Widows in § VI., who have a farm | 11713 | 5668 | 6247 |
| Widows in § IX., who have land | 154 | 70 | 97 |
| Widows of condition, in §§ I., II., III., V., and VII., who cultivate land | 2761 | 580 | 871 |
| Widows living on their own resources | 9658 | 2144 | 3037 |
| Widows that live by trades — In the towns | 7559 | 1829 | 2223 |
| Widows that live by trades — In the country | 31417 | 6521 | 6856 |
| Widows who live with their children | 46510 | 1567 | 1706 |
| Widows in another condition — In the towns | 1474 | 152 | 259 |
| Widows in another condition — In the country | 7613 | 430 | 660 |
| Widows in § XIV. and XV. | 33096 | 2365 | 2941 |
| Orphans in hospitals, or other situations — In the towns | ..... | 1753 | 2216 |
| Orphans in hospitals, or other situations — In the country | ..... | 9827 | 10538 |
| Total | 745873 | 531678 | 533151 |

## § XIII. *Unmarried Women.*

| | | |
|---|---|---|
| Unmarried ladies *(sällskaps fruntimmer)* | | 2674 |
| Governesses | | 302 |
| Housekeepers | | 4443 |
| Chambermaids | | 1133 |
| Servant-girls | In the towns | 26789 |
| | In the country | 330331 |
| Servant-women | In the towns | 2473 |
| | In the country | 33956 |
| Shopwomen in §§ IV., X., XI. | | 218 |
| Tradeswomen in § X. | | 3047 |
| Unmarried women living on their own resourses | | 4740 |
| Unmarried women who live by themselves and support themselves by trades | In the towns | 4219 |
| | In the country | 12960 |
| Unmarried women in §§ XIV. and XV. | | 14851 |
| Total | | 442136 |

§ XIV. *Beggars and Prisoners.*

| | Men. | Women. |
|---|---|---|
| Poor people that live with others | 10395 | 19150 |
| Ditto that live in alms-houses | 10773 | 26478 |
| Ditto in poor-houses | 1933 | 6808 |
| Ditto in hospitals | 545 | 1161 |
| People in the House of Correction, and other prisons | 703 | 396 |
| Total | 24349 | 53993 |

§ XV. *Laplanders.*

| | Men. | Women. |
|---|---|---|
| Laplanders that have rein-deer | 1366 | 1567 |
| Ditto without rein-deer | 586 | 619 |
| Wandering shepherds | 524 | 782 |
| Total | 2476 | 2968 |

§ XVI. *Total of all the Classes.*

| | | Men. | Women. |
|---|---|---|---|
| Total males in | § I. | 13884 | |
| | § II. | 11097 | |
| | § III. | 57788 | |
| | § IV. | 6291 | |
| | § V. | 11313 | |
| | § VI. | 799322 | |
| | § VII. | 35226 | |
| | § VIII. | 15705 | |
| | § IX. | 34309 | |
| | § X. | 30765 | |
| | § XI. | 26184 | |
| | § XII. | 531678 | |
| | § XIV. and XV. | 26825 | |
| Total females in | § XII. | ..... | 1279024 |
| | § XIII. | ..... | 442136 |
| | Total | 1599487 | 1721166 |
| | Grand total | 3,320,647 | |

## ARTICLE II.

*Stations.**

| | Married. | | Widowers. | Widows | Unmarried above 15 years. | | Persons under 15 years. | | Total. | | Grand total. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Men. | Women. | | | Men. | Women. | Men. | Women. | Men. | Women. | |
| Nobility | 1716 | 1788 | 294 | 908 | 1795 | 2052 | 1770 | 1734 | 5575 | 6482 | 12057 |
| Clergy | 3041 | 3031 | 229 | 1264 | 2768 | 2223 | 3438 | 3207 | 9476 | 9725 | 19201 |
| Gentlemen | 15098 | 15021 | 1636 | 4116 | 10572 | 8972 | 13906 | 14788 | 41212 | 42897 | 84109 |
| Burghers | 14450 | 14544 | 1314 | 4585 | 8340 | 8332 | 11863 | 12784 | 35967 | 40245 | 76213 |
| Peasants | 437802 | 438540 | 34602 | 102214 | 302816 | 314616 | 423038 | 424077 | 1198258 | 1280347 | 2478605 |
| All other inhabitants | 115940 | 118940 | 10426 | 40922 | 74813 | 74760 | 107820 | 106842 | 308999 | 341464 | 650463 |
| Total | 588047 | 591864 | 48501 | 154009 | 401104 | 410955 | 561835 | 564332 | 1599487 | 1721160 | 3320647 |

* In the first two columns of this table there is a circumstance which I do not understand; the number of married men and women is not equal. Perhaps the inequality may be accounted for by supposing a certain number of the men or women abroad at the time the table was drawn up.

## ARTICLE III.

*Ages.*

| | 2 | 2 to 5 | 5 to 10 | 10 to 15 | Above 15 | Total. |
|---|---|---|---|---|---|---|
| Rich | 1047 | 4002 | 6942 | 2628 | 1312 | 15931 |
| Middling | 9790 | 49970 | 69110 | 12167 | 2876 | 143919 |
| Poor | 40976 | 149236 | 120109 | 13672 | 3556 | 327549 |
| Very poor | 30689 | 40883 | 18357 | 1660 | 2383 | 93972 |
| Total | 82508 | 244091 | 214518 | 30127 | 10127 | 581371 |

## ARTICLE IV.

*Persons moving from one Country to another.*

| | Men. | Women. | Total. |
|---|---|---|---|
| Coming in | 174080 | 196362 | 370442 |
| Going out | 183264 | 192193 | 375457 |
| Increase | ..... | 4169 | ..... |
| Diminution | 9184 | ..... | 5015. |

# INDEX.


A.

ACADEMY of Sciences in Stockholm, 102.
Ädelfors, mine at, 301.
Aldercreutz, General; his conduct in Finland, 122—Seizes the King of Sweden, 135.
Adlesparr, Col. conduct of, 134.
Afzelii, the, 183.
Age, mine of, 377.
Alopæus, Mr., imprisoned, 123.
Alum slate, 47.
Alum work, 39, 307.
Angelica sylvestris eaten by the Laplanders, 342.
Animals, domestic, in Sweden, 410.
———, wild, in Sweden, 411.
Aplome, 190.
Apophylite, 263.
Arboga, 75.
Army, Swedish, 148.
Arsenal of Stockholm, 101.
Äskär mine, 371.
Augustenburg, Prince; chosen Crown Prince of Sweden, 140—Dies 144.
Automalite, description of 225.

B.

Bagge, Peter, Esq. 38.
Baltic, 386—Constituents of, 387.
Bank of Sweden, 15.
Banks, Captain, 4.
Barclay, Mr., 18.
Basalt, vein of, at Sala, 235.
Bastnäs, account of, 242.
Beds, Swedish, 28.
Bergman, house and laboratory of, 181.
Bernadotte chosen Crown Prince of Sweden, 145—His conduct, 146.
Berries, Swedish, 27.
Big, cultivated in Sweden, 84.
Billingen, description of, 50.
Billow, Mr. Gustavus, 236.
Björby mine, 372.
Bohus, 10.
Botanic garden of Linnæus, 179.
———— Upsala, 180.
Botany, progress of, in Sweden, 172.
Bread of Lapland, 343.
Bridge, singular, 200.
British troops, treatment of in Sweden, 124.
Bronick bay, 259.

C.

Cabinet of Queen Christina, 178.
Calender of the Laplanders, 354.
Camp near Örebro, 66.
Canals, Swedish, 35.
Carl, Knuteson, 414.
Carlstad, 373.
Carriage, 19.
——— wheel broken, 30.
Cathedral at Upsala, 153—At Vesteros, 79.
Cattle in Sweden, 87, 429.
Cement, Lapland, 361.
Cerite, description of, 243.
Charles XII., 415.
Charles XIII. made King, 140.
Christian II., 414.
Churches in Stockholm, 99.
Citizens, Swedish, account of, 72.
Civilization of mankind, 257.
Clara river, 373.
Clergy, Swedish, account of, 70.
——— of Lapland, 350.
Climate of Lapland, 328.
——— Sweden, 404.
Coal mine at Höganäs, 304.
Cobalt ore from Nerike, 64.
——— at Tunaberg, 254.
Coccolite, 282.
Codex argenteus, history of, 196.
Coffee, Swedish, 13.
Constitution of Sweden, account of, 141.
Copper mine at Fahlun, 217.
Copperas, manufacture of, 219.
Corn of Sweden, 409.
Cronberg castle, 303.
Custom-house-officers at Örebro, 67.

D.

Dahlsland, account of, 369.
Dal, river, 200.
Dalecarlia, description of, 203—Structure of, 209.
Dalecarlians, character of, 201.
Dannemora mine, account of, 188.
Dicksons, Messrs., 18.
Diet, Swedish, account of, 69.
Dinners, Swedish, 12.
Diseases of the Laplanders, 347.
Dubb, Dr., 18.
Dundas, Mr., estate of, 81.
Dyeing in Lapland, 361.
Dylta, sulphur work at, 63.

E.

East India Company, Swedish, 435.
Eckman, Dr., 18.
Ekeberg, Mr., 181.
Elfdal porphyry track described, 205.
Elsineur, 303.
English tavern, 82.
Enköping, 81.
Enontekis, temperature at, 320.
Eric XIV., anecdotes of, 79—Monument of, *ib.*
Eric of Pomerania, 414.
Everinus, first Bishop of Upsala, 153.
Exchange at Stockholm, 99.

F.

Fagerberg mine, 380.
Fahlun, description of, 216—Copper mine of, 217—Minerals found at, 225—Mineral cabinet at, 224—Rocks round, 220.
Fahlunite, description of, 227.
Falco Umbrinus, description of, 59.
Farms in Sweden, size of, 427.
Fersen, Count, murdered, 144.
Felspar, green, at Tunaberg, 255.
Finland, conquest of, by the Russians, 122.
Fisher, Mr., 18.
Fitje, 248.

Flail, Swedish, 87.
Fogs, low, accounted for, 260.
Förhopning mine, 370.
Formations in Sweden, 399.
Forrs, 34.
Fruits in Sweden, 408.

G.

Gadolinite, 194, 228.
Gahn, Assessor J. G., 222.
Gahnite, description of, 192.
Geognosy of Sweden, 399.
Geteberg mine, 380.
Glasshouse, 39.
Gneiss of West Gothland, 44.
———, names given to in Sweden, 151.
Gökum, account of, 192.
Gotha river, 10, 24.
Gothland, animals in, 54.
———, East, mineralogy of, 278 — Floetz track in, 279.
———, island of, 307.
Gottenburg, distance of, from Leith, 3.— description of, 8.
Grass sown in Sweden, 85.
Granite, veins of, 252, 270.
Greenstone of Hunneberg, 47.
Grenna, porphyry at, 286.
Gustavus Adolphus, statue of, 90.
Gustavus IV. Adolphus, account of, 118, 415—Unpopularity, 132—Dethroned, 135—Abdicates the throne, 139.
Gustavus III. statue of, 97.
Gustavus Vasa, 414—Statue of, 98—Monument of, 154.

H.

Hafsos Hill, 372.
Halleberg, account of, 45.
Hälleflinta, what, 189.
Handvid iron mine, 264.
Helsingburg, description of, 302.
Herring-fishery, 18.
Hesselkulla, mine of, 62.
Hjelm, Mr., 98.
Hills, Swedish, account of, 204.
Hisinger's classification of rocks, 208.
Höfva, 40.
Höganäs, coal mine at, 304.
Hokeberg mine, 377.
Hollenkar, 24.
Hönsäter alum work, 39.
Hornkullen mine, 380.
Horses, number of, in Sweden, 429.
Hotel in Gottenburg, charges at, 19.
Houses, Swedish, 11—In Stockholm, 110.
Hunneberg, height of, 43—Structure of, 45.
Hvassvik mine, 371.
Hyacinths of Bergman, 182.

I.

Jämtland, account of, 369.
Janet smack, 2.
Järta, Mr., 224.
Ichthyophthalmite, 263.
Inclosures, Swedish, 26.
Inns, want of, in Sweden, 7.
John III. monument of, 155.
Iönköping, description of, 284.
Iron mines in Sweden, 403—In Nerike, 62.
Iron produced in Sweden, 403, 431—Of Dannemora, 191 — Used for roofing houses, 216.
Iron ore of Dannemora, method of smelting, 190.
Iron ore, new, 266.
Juniperberry bushes, 27.

K.

Kalmar, treaty of, 414.
Kärra, 34.

Kärringbricka hill, 241.
Kattegat, 385.
Kennedy, Mr., 18.
Kernsberg mine, 380.
Kinneculle, height of, 43—Description of, 48.
Kisa of the Laplanders, 340.
Klapperud mine, 371.
Knolle mine, 370.
Köping, meaning of the word, 42—Town so called, 76.
Kopparberg, new, 245.
Krokos mine, 377.

L.

Lakes of Sweden, 393.
Lampert, Dr., 17.
Land, arable, in Sweden, 427.
Lapland, account of, 311—Climate of, 312—Woody, 313—Subwoody, *ib.*—Subalpine, *ib.*—Alpine, *ib.*—Temperature of, 318—Temperature of the earth in, 325—Number of inhabitants in, 338.
Laplanders, customs of, 339—Dress of, 344—Food of, 343—Treatment of strangers by, 350.
Laurentius Petri, first Protestant Archbishop of Upsala, 156.
Laws respecting posting, in Sweden, 74.
Lepidolite, 264.
Lidköping, 38.
Lilla Oby, 250.
Limestone of Kinnekulle, 49.
——— magnesian, character of, 233.
Lindbom mine, 380.
Linköping, description of, 271.
Linnæus' dismal journey in Lapland, 364—monument of, 172.
Longbanshytte mine, 380.
Lorent, Mr., 16.
Lugnos, description of, 51.

M.

Malefactors hung in chains, 66.
Manganese, red ore of, 379.
Manufactures of Sweden, 430.
Maps of Stockholm, 92.
Margaret, Queen of Scandinavia, 413.
Mariestadt, 40.
Maritime Lapland, temperature of, 322.
Marriages of the Laplanders, 351.
Mastuget, 6.
Medical men at Gottenburg, 18.
Medvi, waters of, 277.
Metals found in Sweden, 430.
Milk, how used by the Laplanders, 341.
Mineral at Ädelfors, 301—At Nordmark, 375—At Tunaberg, 255.
Minerals in the College of Mines, Stockholm, 105—At Upsala, 181.
Mineralogy of Lapland, 336—Progress of, in Sweden, 173.
Mint at Stockholm, 98.
Money, Swedish, 14.
Mora Stenar, 152.
Moore, Sir John, treatment of, in Sweden, 173.
Motala river, 269—Valley of, 270.
Mountains of Lapland, height of, 314.
———, Swedish, account of, 397—Height of, 317.
Music of the Laplanders, 346—Swedish, 14.

N.

Natrolite, Swedish, 62.
Nerike, description of, 61.
New Elfsborg, 6.
Nobles, Swedish, account of, 69.
Nordmark mine, 375.
Norköping, account of, 268.
Norrland, account of, 368.

North Cape, temperature of, 323.
Norwegian vessel detained, 4.
Notes, Swedish, 14.
Nötö mine, 370.
Ny Gärden, 38.
Nyhyttan mine, 375.

O.

Ochroita, 243.
Oland, island of, 307.
Olof Essen, conduct of, 31.
Onez glass-house, 39.
Opera-house at Stockholm, 91.
Ore of Fahlun, how smelted, 221.
Örebro, description of, 68—Manufactures of, 75.
Osarne mine, 380.
Österby, 186.
Ostra mangs mine, 381.

P.

Palace at Stockholm, 96—At Upsala, 153.
Passports, 247.
Peasantry, Swedish, 29.
Peasants, Swedish, account of, 71.
Pehrsberg, 374.
Petersburg, climate at, 405.
Petrefaction from China, 105.
Philipstad, 373.
Piper, Count, house of, 270.
Plants growing at different heights in Lapland, 330—Number of species in Lapland, 335.
Porphyry at Grenna, 280—At Elfdal, 205, 400.
Porter, 16.
Potatoes, not much used in Sweden, 65.
Provinces, Swedish, 21—Size of, 391.
Ptarmagans, how caught in Lapland, 363.
Pyrophysalite, description of, 227.

R.

Rain in Sweden, 407.
Rein-deer, account of, 355.
Remedies of the Laplanders, 349.
Remsberg mine, 380.
Retzius, anecdote of, 77.
Revolution, Swedish, account of, 133.
Ridderhyttan mine, account of, 241.
Rivers in Sweden, 395.
Roads, Swedish, 26.
Rocks, how classified by Hisinger, 208.
Rolfsby mine, 370.
Royal Society of Upsala, 184.
Rudbeck, 171.
Russian soldier, anecdote of, 187.
Ruthile, variety of, 241.
Rye, cultivated in Sweden, 84.

S.

Sacristy at Upsala, curiosities in, 156.
Sailors, British, mob of, 247.
Sala, town of, description of, 233—Structure of the country round, *ib.*—Mine, account of, 235—Minerals found in, 237—River, 157.
Salite, description of, 238.
Sanna, mine of, 63.
Scaggerak, 385.
Scapolite, 265.
Scheele, anecdotes of, 76.
Schultz, Dr., 18.
Sconia, geognostic constitution of, 306.
Scotch Highlanders, generosity of, 33.
Scottish dialect, account of, 107.
Sea, colour of, 3—Temperature of, 4.
Selscap, account of, 112.
Sheep, number of in Sweden, 429.
Silver, native, found, 372.
Sinclair, Mr., 18.
Sirnames, Swedish, 198.

Slädkärr mine, 372.
Sledges of Lapland, 361.
Sleeve, the, 385.
Smoland, description of, 298—Geognostic structure of, 300.
Snow, effects of, on vegetation, 333.
Södermanland, 249.
Soldiers' houses, 197.
Sound, the, 303.
Spinell in limestone, 105.
Spodumene, 261.
Stafford, Mr., 304.
Steel, manufactory of, 191.
Stephen, first Archbishop in Sweden, 154.
Stjernberg mine, 380.
Stinkstone, 47.
Stockholm, account of, 89—Population of, 94—Tradesmen in, *ib.*—Climate at, 405.
Stoves, Swedish, description of, 111.
Stræmming, 412.
Stures, monument of, 156.
Svarton river, 68.
S denstierna, Mr., collection of, 106.
Sudermania, Duke of, made King, 140.
Sulphur work at Dylta, 63—At Fahlun, 219.
Sunday, observance of in Sweden, 100.
Sweden, size and boundaries of, 385—History of, 413—Inhabitants in, 418—Revenue of, 420—Constitution of, 421 Army of, 423—Resources of, 425—Agriculture of, *ib.*
Swedes, partial to France, 146.
Swedish Academy, 106.
——— coast, appearance of, 5.
——— conquests, 41.
——— languag 09.

T.

Taberg, description of, 286, 376—Opinions respecting its nature, 289.
Tamm, Mr. P., 187.
Tanning, how performed in Lapland, 361.
Tantalum, 401.
Tar made in Sweden, 432.
Tea, Swedish, 13.
Tents, Lapland, 339.
Theatre at Stockholm, 91.
Thrashing mills, 87.
Thyn, mine of, 380.
Timber exported from Sweden, 432.
Tingwalla, island of, 373.
Tobacco, much used in Sweden, 65.
Törner, Mr., 157.
Torrakeberg mine, 380.
Torrents in hilly countries, 252.
Torskebäck mine, 375.
Trade of Sweden, 433—Abuses in, 434.
Travelling in Sweden, mode of, 23.
Trees in Sweden, 25.
Trollhätte, 34—Falls of, 35.
Tunaberg, account of, 254—Mines of, 256.

U.

Vegetation of Lapland, 328.
Vein of granite, 252.
Vener lake, 393.
Vermeland, account of, 373.
Vesteros, 79.
Vetter lake, 273, 394—Alluvial track of, 280—Porphyry at, *ib.*
Victory, the, 5.
Vingnäs mine, 371.
Yisingsö, island of, 281.
University of Upsala, account of, 158—Teachers in, 160.
Upland, account of, 151—Iron mines in, 195.
Upsala, description of, 152, 157—First Bishop of, 153.
Uto mine, 261.

W.

West Gothland, journey through, 21—Mineralogy of, 41—Size of, 42—Rivers in, *ib.*
Westmanland, description of, 232.
Wheat cultivated in Sweden, 84.
Winga beacon, 5.
Winter, Swedish, 406.

Y.

Ytterby, account of, 193.

Z.

Zealand, 303.
Zircon in iron ore, 105.

## ERRATA.

Page 22 line 14, for *north* read *south.*
—— 152 —— 5, for *horblende* read *hornblende.*
—— 202 —— 6, for *vatter* read *vatten.*
—— 393 —— 25, for *lakes* read *licks.*
—— 395 —— 7, for *ever* read *even.*
—— 396 —— 14, for *at* read *in.*
—— 411 —— 10, for *at* read *as.*

THE END.

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